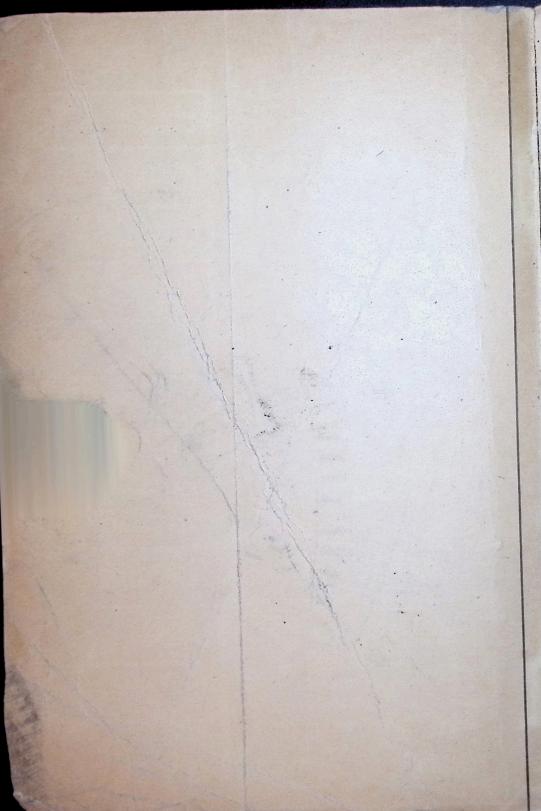
TRACTOR, CRAWLER,
DIESEL,
70 to 90-DBHP, STANDARD,
INTERNATIONAL TD-18,
74-inch GAGE

MAINTENANCE INSTRUCTIONS AND PARTS CATALOG

JANUARY 194



### TracTracTor Model TD-18

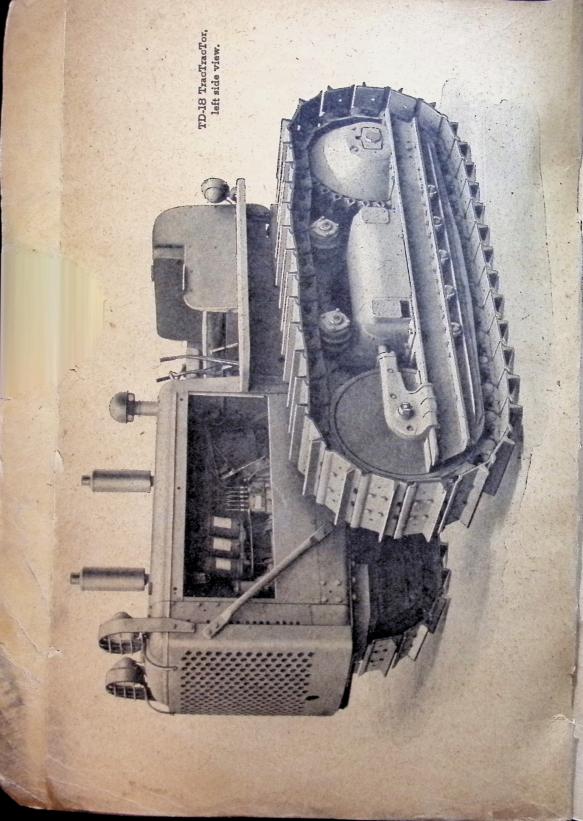
## OPERATIONS SECTION

Each section has a black tab which lines up with the corresponding section name and number shown at the right.

The black tabs are quickly located by bending this book back.

INTERNATIONAL HARVESTER COMPANY
180 NORTH MICHIGAN AVE. CHICAGO 1, ILLINOIS, U.S.A.

DRIVING INSTRUCTIONS	G
BRAKES (STEERING)	1
CHASSIS	2
CLUTCHES	3
COOLING SYSTEM	4
ELECTRICAL AND MAGNETO	5
ENGINE	6
FUEL SYSTEM	1
LUBRICATION	8
TRACKS	9



### SPECIFICATIONS

CAPACITIES (U.S. Measure)	
Gasoline tank	
ENGINE (DIESEL TYPE) (45° Head)	
Engine speed (governed)	4-3/4 in. 6-1/2 in. 1200 R.P.M. Bosch 1-1/4 in. 1HC Type F-6 17 plate
ENGINE CLUTCH	
Over-center type (hand-controlled	i)
STEERING CLUTCH	
Multiple dry disc - spring-loaded	d type with manual release. 15 in.
BRAKES	
External contracting on steering	clutch drums 17 in.
TRACK	
Tread (standard)	62 in. 74 in
TRANSMISSION	
Six speeds forward - M.P.H.  Two speeds reverse - M.P.H.	Jow     1-1/2       Second     8       Chird     2-1/2       Fourth     3-3/8       Fifth     4-5/8       High     5-3/4       Jow-Reverse     1-1/2       H-Reverse     3-3/8
GENERAL OVER-ALL DIMENSIONS	
Drawbar height (above ground line	exhaust muffler 93-7/8 in.

### DIESEL FUEL SPECIFICATIONS

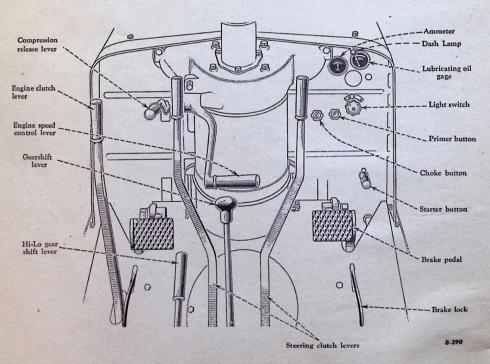
Do not use dirty fuel.

Diesel fuel for high-speed automotive-type Diesel engines. NOTE: Pour point must be lower than minimum temperature at which fuel is to be used.

### GRADE:

Class A Class B

Class X (Winter grade)



Illust. I - Operating Controls.

### INSTRUMENTS AND CONTROLS

### COMPRESSION RELEASE LEVER

Pulling down on the compression release lever converts the Diesel into a gasoline engine for starting. Reduced compression, sparkplug ignition, and carbureted gasoline fuel permit starting the engine as a gasoline engine. After a quick cylinder warmup, switch the engine to Diesel operation by pushing the compression release lever all the way up. Refer to page 6 for correct method of starting on gasoline and changing to Dieseloperation. See page 8 for changing back to gasoline operation before stopping engine, and then place compression release lever back in Diesel position after engine is stopped.

### ELECTRIC STARTER BUTTON

Pressing on this button with the foot completes the electrical circuit between the battery and the starting motor and causes the starting motor pinion to engage the flywheel ring gear, thereby cranking the engine. Stop pressing the button the moment the engine starts. Do not run the starting motor for more than 30 seconds at any one time.

### CHOKE BUTTON

Helps start the engine when the engine is cold. Pulling out the rod shuts off air to the carburetor, enriching the mixture. After the first few revolutions of the engine, push the choke button in half way, or to a point where the engine runs without missing. Push the choke all the way in after the engine has started. Do not run the engine with the choke rod out.

### PRIMER BUTTON

When starting in cold weather the engine should be primed. A few strokes of the primer button, which sprays raw gasoline directly into the intake manifold, are usually

sufficient. The number of strokes will depend on the operating temperature.

### LIGHT SWITCH

Controls the battery charging rate. In its regular position at "L" it is set for low charging. Turn to the first position at the right, "H", for high charging rate, to second position "D" for dim lights, and to position "B" for bright lights. (Also see page 2, Section 5.)

### AMMETER

This is the check on the electrical system. It indicates whether the battery is being charged or discharged. When the engine is operating, the needle should be in the "Charge" range. If the ammeter shows discharge continuously, the cause should be investigated to avoid completely "running down" the battery.

### LUBRICATING OIL GAGE

Indicates the pounds of pressure of the oil circulating through the engine. The indicator needle should be in the white area when the engine is running. If the indicator is not in the white area, stop the engine immediately and investigate the cause of the oil pressure failure. (Notify proper maintenance personnel.)

### ENGINE SPEED CONTROL LEVER

Controls the speed of the engine, and, when set in a given position, maintains a uniform engine speed under variable loads.

### ENGINE CLUTCH LEVER

Is used to disengage the engine from the transmission. Push the engine clutch lever all the way forward to disengage the engine clutch.

### INSTRUMENT AND CONTROLS - Continued

### GEARSHIFT LEVER

Is used to select the various gear ratios provided in the transmission. There are three forward positions and one reverse position, a total of six forward speeds and two reverse by using the high and low range gearshift lever.

### HI-LO GEARSHIFT LEVER

Is used to double the range of speeds. Moving the lever forward gives the low range, and backward the high range.

### STEERING CLUTCH LEVERS

Are used to steer the tractor. Pulling back on either steering lever releases the steering clutch

and makes the track on that side inoperative. To turn left, pull on left lever and to turn right, pull on right lever.

### STEERING BRAKE FOOT PEDALS

Operating the steering brakes helps in turning the tractor. Never apply the steering brake until the steering clutch is fully released. Do not use the brake unless it is necessary to make a sharp turn.

### STEERING BRAKE LOCKS

Each steering brake pedal has a locking device to hold the tractor whenever necessary. To lock either brake, push foot brake pedal down and lift up ratchet pawl, which engages in the ratchet, locking the brake pedal.

### BEFORE STARTING A NEW TRACTOR

Make a complete inspection of tractor for any shortage or damage which may have occurred while being shipped.

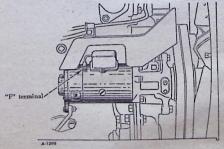
### LUBRICATION

- (1) Lubricate the entire tractor, using the "Lubrication Guide."
- (2) Check the oil levels of the engine crankcase, air cleaner, transmission case and sprocket drive gear cases to see that they are filled to the correct levels with the proper grades of oil for the prevailing temperature. (Refer to specifications of lubricants in the "Lubrication Guide.")
- (3) Tractors shipped to destinations in the United States of America, Canada, and Mexico are filled with oil in all parts before leaving the factory. However, the lubricant compartments should be checked for proper levels as outlined in tem 2 above.

### TRACTORS PACKED FOR EXPORT

All oil is drained from the engine crankcase, air cleaner, and from all the gear cases of tractors packed for export.

(4) Engines shipped to destinations in the United States of America, Canada and Mexico are filled with thinned SAE-10 oil when leaving the factory. For further information, refer to "Lubrication Guide."



Illust. 2 Showing "F" Terminal or Generator

### BEFORE STARTING A NEW TRACTOR - Continued

### ENGINE COOLING SYSTEM

Be sure radiator is filled with clean water. (Use soft or rain water if possible.) For further information refer to "Cooling System", page 1, Section 4.

If the tractor is to be operated in freezing temperatures (32° F. or lower) refer to "Cold Weather Operations" on page 11.

### ELECTRICAL SYSTEM

Fuel tank

filler cap

Tractors are shipped with braided ground strap disconnected at battery end. In addition the connection at the "F" terminal on the generator is not completed. Do not operate the tractor until battery ground cable is connected and generator wire has been connected at "F" terminal. (See Illust. 2.)

Batteries when shipped dry should be serviced as outlined on instruction tag attached to the battery.

### PREPARING TRACTOR FOR DAILY OPERATION

### (1) FUEL SYSTEM (See Illusts. 3 and 4)

Fill the main fuel tank (capacity 60 gallons, U.S.). For fuel specifications refer to page 2. Fill the gasoline tank with a good grade of clean gasoline (capacity is approximately 1-1/2 gallons, U.S.).

Carefully strain the gasoline and the Diesel fuel to be sure they are free from foreign substances. Do not use dirty fuel.

Exercise extreme care when filling fuel tanks from drums or similar containers. Do not take the last 4 inches because water may be in the bottom of the container. This remainder can be accumulated in several containers, poured into one container, and allowed to settle. The fuel can be pumped out down to the last 4 inches.

### Fuel tank Diesel fuel shut-off valve

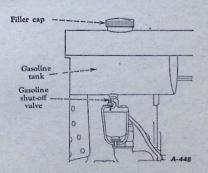
Illust. 3 -- Showing the Fuel Oil Tank and Shut-off Valve.

### (2) COOLING SYSTEM

Remove the radiator cap and check to see that water is up to a level slightly below bottom of filler opening. If the system has been drained See instructions on page 1 of Section 4.

### (3) LUBRICATION

Check for any leakage from lubricant compartments. Be sure oil in crankcase is up to full level mark on oil gage. Refer to "Lubrication Guide" for complete lubrication requirements.



Illust. 4 -- Showing the Gasoline Tank and Shut-Off Valve.

### OPERATING THE DIESEL ENGINE

Four steps are necessary in operating this diesel engine.

- (1) Starting engine on gasoline.
- (2) Changing over to Diesel. .
- (3) Changing back to gasoline before stopping engine -- to facilitate next starting.
- (4) Putting compression release lever in diesel position after stopping the engine on gasoline to permit starting valves to cool on their seats.

The above steps are fully explained in the following pages.

### TO START THE ENGINE

(See Illust. 1 - Operating Controls)

(See Illust. 5 - Engine Controls)

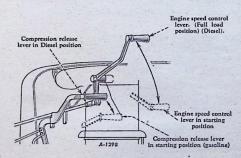
- 1) Place the gear shift lever in eutral position and disengage the ngine clutch by pushing lever all the way forward.
- (2) Pull the compression release lever down to starting position.
- (3) Pull the engine speed control lever back to starting position and leave in this position until the engine is changed to Diesel operation.
- (4) Pull choke button out part way. (In cold weather pull out all the way). Give the primer button several strokes in cold weather if necessary.
- (5) Step on starter button.
- (6) Push choke button in to where the engine runs without missing and gradually push all the way in.
- (7) Check the engine oil pressure. If the gage does not indicate any pressure, stop the engine and inspect the oil system to find the cause of the failure.
- (8) Engine is now running on gasoline cycle and should operate for about a minute (2 or 3 minutes in cold weather) before switching to diesel fuel).

NOTE: If trouble is experienced in starting the engine refer to page 10, "Operating Precautions". Also see "Cold Weather Operation", page 11.

### TO CHANGE TO DIESEL OPERATION (See Illust. 5 - Engine Controls)

- (1) Push the compression releaselever all the way forward.
- (2) Immediately advance engine speed control lever far enough to keep engine from stalling.

NOTE: The carburetor and magneto are cut out and auxiliary combustion chamber is closed, isolating the spark plugs when compression release lever is put in the "Diesel position".



Illust. 5 - Engine Controls.

### TO HAND CRANK THE ENGINE (IF NECESSARY)

If it is necessary to crank engine with hand crank, assemble crank adapter in coupling in place of power take-off shaft.

- (1) Pull the choke out all the way.
- (2) Crank with two or three half up-strokes.
- (3) Then push choke three-quarters of the way in and crank with half up-strokes until engine starts.

### OPERATING THE TRACTOR

### SAFETY FIRST!

Before dismounting from the tractor put the gear shift lever in neutral position.

Read and observe "Operating Precautions" on page 10.

After the tractor is in motion extreme care should be taken to

prevent accidents and personal injuries.

Before attempting to drive the tractor the driver should be thoroughly familiar with all of the instruments and controls. See page 3 for description of all the instruments and controls.

### DRIVING THE TRACTOR (See Illust. 1)

When the engine has been running long enough to warm up, set the engine speed control lever in the idling position (lever slightly up from lowest position). Disengage the engine clutch by pushing the engine clutch control lever (on left hand side) forward as far as it will go. Continue to press forward on the clutch lever to apply the clutch brake until the clutch stops turning, then carefully move the gear shift lever to the speed desired.

After putting the transmission gears in mesh, advance the engine speed (by raising engine speed control lever) enough to keep the engine from stalling, and carefully engage the engine clutch until the slack is taken up between the tractor and the load, then pull the clutch lever back until full overcenter cam engagement is definitely felt.

ON A NEW TRACTOR - Do not operate a new tractor immediately on a

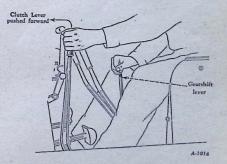
full load; run light for a reasonable length of time.

Do not overload the tractor at any time.

### GEAR SHIFTING

CAUTION! DO NOT SHIFT GEARS WHILE TRACTOR IS IN MOTION.

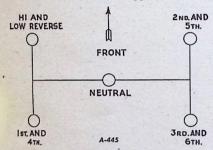
Always disengage the clutch before shifting gears. (See above para-graph).



Illust. 6
Disengaging Engine Clutch
to Shift Gears.

### OPERATING THE TRACTOR - Continued

There are three forward positions and one reverse position in the transmission giving six forward speeds and two reverse speeds by using the high and low range gear shift lever. Once a speed has been selected and the tractor is in operation, further gear shifting should not be attempted until clutch is completely disengaged and the tractor is stopped.



Illust. 7
Showing the Various Gear
Shifting Positions.

### HI-LO RANGE

The high and low range of the transmission is controlled by the Hi-Lo gear shift lever (See Illust. 8). Moving this lever forward gives a low range, and backward a high range.

When the Hi-Lo lever is in the "down" position (forward), the tractor can be shifted with transmission gear shift lever to low-reverse, first, second, or third speeds. When the Hi-Lo lever is in the "up" position (backward), the tractor can be shifted to high-reverse, fourth, fifth, or sixth speeds.

### TO STOP TRACTOR

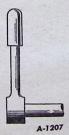
Disengage the clutch by pushing the clutch lever forward and move

the gear shifting lever to neutral position. Use the brakes if necessary.

SAFETY FIRST! Put the gear shift lever in neutral position.

### TO STOP ENGINE

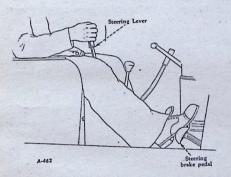
- (1) Make sure gasoline supply is turned on.
- (2) Retard the engine speed control lever and at the same time pull the compression release lever all the way back (to gasoline position).
- (3) Shut off the gasoline fuel supply at the tank and allow the engine to use up the fuel in the carburetor.
- (4) After engine stops on gasoline, push the compression release lever up to "Diesel" position to permit the starting valves to cool on their seats.



Illust. 8
Hi-Lo Range Shifting Lever
Up (Backward) Postion
Hi-Range
Down (Forward) Postion
Lo-Range

### STEERING THE TRACTOR

- (1) Turn to the right or left by pulling back the steering clutch lever on the side to which the turn is to be made.
- (2) To make a sharp turn, use the steering brake on the side toward which the turn is to be made. For example: To turn sharply to the right, pull back on the right hand steering clutch lever and then push down on the right steering brake pedal.
- (3) If pulling back on the steering clutch lever does not turn the tractor enough, and if pushing the steering brake all the way down turns the tractor too much, press down gently on the steering brake pedal until the desired turn is made.



lilust. 9 Turning to the right.

### STEERING DOWN GRADE

- (1) When going down grade with the tractor pulling the load, steering should be done in the usual manner.
- (2) When going down grade, if the load is pushing the tractor, the steering clutch operation is reversed. Disengage the right steering clutch to turn left, and the left steering clutch to turn right. Do not apply the brakes.

### OPERATING OVER AN OBSTRUCTION

When running over a log or ditch bank, use the steering clutches instead of the engine clutch to slow the tractor. Both steering clutches may be released slightly until the tractor balances on the top of the obstruction. Then, engage one clutch gradually so the tractor moves forward at an angle, over and down. If load is light, it might be necessary to use the brakes.

### STEERING BRAKE LOCKS

Each foot brake pedal is provided with a locking lever device. To lock either brake, push the foot brake pedal down and lift up the ratchet pawl (see Illust. 1). This engages the pawl in the ratchet (see Illust. 1, Section 1) and locks the brake pedal.

Do not use the brake pedals as foot rests; this causes undue wear on the brake parts.

### OPERATING PRECAUTIONS

- (1) Do not attempt to start the engine by towing or coasting the tractor. To do so may cause serious damage to the engine and transmission.
- (2) Do not run starting motor for more than approximately 30 seconds at any one time.
- (3) If trouble is experienced in starting on gasoline in cold or damp weather, the spark plugs should be removed and wiped off, removing any condensation. At the same time check the spark plug gap which should be .035" to .040" after drying the spark plugs. Replace them in the engine and start as usual.
- (4) If it is necessary to hand crank the engine, the operator should stand in a position that will eliminate any possibility of being struck by the starting crank if there is a reversal of the direction of the engine. Crank the engine by using quick up-strokes; do not spin it.
- (5) SAFETY FIRST! Never fill the gasoline tank when lamps are lighted, when near an open flame, or when the engine is running. Keep the funnel, used for pouring in the fuel, in contact with the metal of the tank. By so doing,

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Illust. 10 Showing correct method of Pouring Gasoline into Tank.

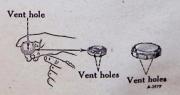
you will avoid the possibility of an electric spark igniting the gas. Do not light matches near gasoline as the air within a radius of several feet is permeated with a highly explosive vapor.

See that the vent holes in the fuel and gasoline tank filler caps are kept open at all times to assure proper flow of the fuel.

- (6) Do not pour cold water into the radiator if engine is very hot unless conditions make it absolutely necessary. Under such conditions, start the engine and let it idle while slowly pouring water into the radiator.
- (7) Do not apply the steering brake until the steering clutch is fully released as excessive heating and rapid wear of steering brakes will result.

When pulling a load, it is not necessary to use the steering brakes except to make sharp turns; the load itself acts as a brake. Do not use the brakes unless it is necessary to do so in order to make the required turn.

- (8) Do not ride the brake pedals, as this will result in excessive wear on brake linings.
- (9) Improper use of the steering brakes when making turns will cause the tractor to jerk. Try to avoid this by using the steering



Showing Air Vent Holes in Gasoline and Fuel Tank Caps.

### OPERATING PRECAUTIONS - Continued

control lever intermittently with only a slight pressure on brake pedal when making any turn except a pivot turn. This method of turning gives you a more even turn and does not subject the tractor to sudden impacts.

- (10) The drawbar should be free to swing at all times unless it is absolutely necessary to hold it in one position.
- (11) Do not shift gears while tractor is in motion.
- (12) Immediately after engine starts, check the oil pressure indicator to see if it is registering pressure. If it is not, stop engine and inspect oil system to find the cause of failure. If unable to find cause, be sure to notify the proper maintenance personel before operating engine.



Illust. 12 Oil Pressure Indicator.

- (13) If tractor is equipped with power take-off, stop power take-off before dismounting from tractor.
- (14) Be sure to replace lubricating oil filter elements, and clean air cleaner at regular intervals as specified.

### COLD WEATHER OPERATION

If the tractor is to be operated in temperatures of 32° F. or lower, observe the following precautions:

### FUEL SYSTEM

Use only a high-test winter-grade gasoline for starting. Keep the supply in a closed container so the more volatile portion does not evaporate.

Fill the fuel tank at the end of the day's run to prevent moisture from collecting in the tank.

Never allow the fuel to get lower than 2 inches from bottom of the fuel tank.

### STARTING THE ENGINE

Prime the engine with gasoline using 4 or 5 strokes of the primer. The number of strokes will depend on the temperature.

If the tractor is equipped with a radiator shutter and heat indicator, close shutter when starting: then regulate it as required to hold the needle of the heat indicator in the high side of the "RUN" range.

### LUBRICATION

Be sure to use the correct grade of lubricant in the engine crank-case, injection pump, air cleaner, magneto impulse coupling, transmission, track rollers, track idlers and sprocket drive gear case as specified in the "Lubrication Guide."

### TRACKS FROZEN TO GROUND

If the tractor is left out during cold weather and the tracks become frozen to the ground loosen the tracks before starting the tractor.

### COLD WEATHER OPERATION - Continued

Do not attempt to jerk them loose with the power of the engine because the sudden impact, if the tracks should not break loose, may damage the tractor.

### OPERATING IN WATER OR SNOW

When operating the tractor in deep water, or in snow that is in a thawing condition, lubricate the track rollers every four hours. This will flush out the water that might be forced past the seals and into the lubricant. If operating the tractor in water that is deep enough to submerge the bottom of the transmission case, inspect the lubricant in the transmission case and in the drive gear sprocket cases frequently. If any water is present, drain these cases and refill with new oil.

MOTE: When operating the tractor in water, or under extremely dusty conditions, water or dust might come in through the holes in the drain plugs on the engine clutch and steering clutch compartments. To avoid this take out these drain plugs and replace them with solid plugs which have no holes. Occasionally remove the plugs to allow any oil accumulation to drain out.

### COOLING SYSTEM

When the temperature is likely to be 32° F. or lower, there is danger of the water freezing in the cooling system. To overcome this, either drain the water from the cooling system at the end of each run, or use the recommended antifreezing solution.

IMPORTANT! Before filling the radiator in freezing weather, cover the entire radiator and start the engine; then put in the water immediately. This prevents the water from freezing during the warming up period.

### TO DRAIN THE SYSTEM

- (1) Open the radiator drain cock on the lower right-hand side of the radiator, below the fan idler pulley. (See Illust. 2, Section 4.)
- (2) Open the drain cock in the right-hand side of the crankcase. (See Illust. 2, Section 4.)
- (3) Check to see that the drain cocks are not clogged and that the water drains completely.

### ANTI-FREEZE SOLUTIONS

The table shown below gives the quantities of anti-freeze to be added per gallon of water. To determine the total quantity necessary, multiply the capacity of the cooling system (27 gallons, U.S.) by the number of pints per gallon required at the prevailing temperature.

CAUTION! Do not mix anti-freeze solutions.

Do not under any circumstances use any of the following in the cooling water as an anti-freeze.

Honey, salt, kerosene, Diesel fuel, glucose or sugar, calcium chloride or any alkaline solution.

Freezing Point (Fahrenheit)	Ethylene Glycol
	(Pints Required Per Gallon)
10° 0° -10° -20° -30° -40° -50° -60° -70°	2 2-1/2 3 3-1/2 4 4-1/2 4-1/2 5 5

### PERIODIC INSPECTIONS

To assure mechanical efficiency tractors should be systematically inspected at intervals outline below:

### AFTED & HOURS OF OPERATION

AFTER 8 HOURS OF OPERATION		
Point of Inspection	Remarks	
Lubrication points	Refer to "Lubrication Guide."	
AFTER 64 HOURS OF OPERATION		
Point of Inspection	Remarks	
*Air cleaner, complete	Remove and clean. (Refer to page 2, Section 6.)	
* - When unusual mud or dust condition it may be necessary to service thi	s are encountered during operation s point more frequently.	
Flexible rubber connection between air cleaner and air intake pipe	Inspect for loose fit or damage. (Refer to page 3, Section 6.)	
Diesel fuel water trap	Take apart and clean. (Refer to page 1, Section 7.)	
Fan belts	Check tension; replace when necessary. (Refer to page 2, Section 4.)	
Radiator fins	Clean spaces. (Refer to page 2, Section 4.)	
Battery liquid	Check amount and specific gravity. (Refer to page 1, Section 5.)	
Battery terminals	Clean and grease. (Refer to page 2, Section 5.)	
Steering clutch housing drain plugs.	Remove plugs and drain oil accumulation. (Refer to "Lubrication Guide.")	
Tracks	Check slack. (Refer to page 1, Section 9.)	
Lubrication points	Refer to "Lubrication Guide."	
AFTER 128 HOURS	OF OPERATION	
Point of Inspection	Remarks	
Lubricating oil filters	Replace filter elements. ((Refer to page 3, Section 6.)	
Engine crankcase	Drain and change oil. (Refer to "Lubrication Guide.")	
Generator commutator	Clean. (Refer to page 2, Section 5.)	

Lubrication points . . . .

Diesel fuel filter . . .

Refer to "Lubrication Guide."

Clean and wash elements. (Refer to page 2, Section 7.)

### PERIODIC INSPECTIONS - Continued

### AFTER 256 HOURS OF OPERATION

Point of Inspection	Remarks
Gasoline strainer and sediment bowl.	Take apart and clean. (Refer to page 1, Section 7.)
Governor breather on injection pump.	Remove and clean. (Refer to page 6, Section 7.)
Spark plugs	Remove and clean; check gap. (Refer to page 5, Section 5.)
Magneto breaker points and chamber .	Clean chamber and check gap. (Refer to page 8, Section 5.)

### AFTER 512 HOURS OF OPERATION

Point of Inspection.	Remarks
Fuel line screen (at carburetor)	Remove and clean. (Refer to page 3, Section 7.)
Cooling system	Clean. (Refer to page 2, Section 4.)
Engine valves	Check for clearance. (Refer to page 4, Section 6.)
Steering clutch hand levers	Check for free movement at handles. (Refer to page 2, Section 3.)
Steering brake pedal	Check for free movement at pedal pad. (Refer to page 1, Section 1.)
Lubrication Points	Refer to "Lubrication Guide."

### STORING AND HOUSING DIESEL TRACTORS

When the tractor is not to be used for a period of time, it should be stored in a dry and protected place. To leave equipment outdoors, exposed to the elements, will result in materially shortening its life.

The following procedure should be followed when the tractor is placed in storage for 30 days or more and the lubrication precautions should be repeated every six months thereafter. We also recommend caution to be practiced in starting an engine that has been in storage. (Refer to instructions on the next page.)

- (1) Wash or clean and completely lubricate the tractor. (Refer to "Lubrication Guide.")
- (2) Drain the lubricating oil from the Diesel injection pump and governor and refill with new oil as specified on "Lubrication Guide."
- (3) Close the Diesel fuel shut-off valves, (see Illust. 3), clean water trap and drain Diesel fuel filter. Disconnect Diesel fuel supply line at inlet side of Diesel fuel supply pump. Also disconnect fuel return pipe at injection pump. Connect a suitable tubing to the inlet side of Diesel fuel supply pump and lead the free end of the tubing into a container of flushing oil. Recommended flushing oils are Gulf Oil Corporation No. 301, Shell Latus No. 22 Oil, Formula No. 11326 Standard Oil Company, No. 8504 or E382 Socony Vacuum Oil Company or Capella Oil AA. (In emergencies a flushing oil mixture of 1/2 kerosene and 1/2 good grade of light lubricating oil may be used.)

Start and operate the engine on gasoline until sufficient fuel has been used to assure filling the Diesel fuel filter and flushing the pump. (This will require approximately 2 quarts of flushing mixture to fill filter). (Filling of fuel filter can be determined by opening air bleed on top of fuel filter).

After fuel filter has been filled, engine should continue on gasoline for an additional 5 minutes to assure flushing of internal parts of pump. Then drain flushing oil from fuel filter. Reconnect regular fuel supply line and fuel return pipe to the fuel supply pump.

- (4) Drain water from the cooling system.
- (5) Oil magneto impulse coupling liberally with the grade of oil specified in the "Lubrication Guide."
- (6) Remove spark plugs and put the compression release lever in the gasoline (starting) position. Pour one tablespoonful of SAE-50 lubricating oil of good grade through spark plug opening into each cylinder. Put the compression release lever in the Diesel position.
- (7) Remove valve housing cover and spray oil over rocker arm and starting valve assembly. Replace cover.
- (8) Cover exhaust pipe with a tin can to prevent moisture from entering manifold.
- (9) Remove the oil filter elements. (If any evidence of rust is found on the center stud, clean thoroughly.) Replace filter elements with new ones and drain out any sludge from filter base.

THE ENGINE MUST NOT BE RUN AFTER FLUSHING OPERATION.

### BEFORE STARTING DIESEL ENGINES THAT HAVE BEEN IN STORAGE

- (1) Remove the spark plugs and put the compression release lever in the gasoline (starting) position. Pour a mixture of one-half gasoline and one-half engine oil, SAE-10, into each cylinder (two table-spoonfuls per cylinder is sufficient).
- (2) Remove valve housing cover and flush valve and valve operating mechanism with same mixture.
- (3) Crank engine rapidly until excess oil has been blown out of spark plug holes. (This operation will loosen any tight piston rings and wash old gummy oil from valves and pistons.)
- (4) Flush out the impulse coupling with the same grade of oil used for lubrication and lubricate as specified in the "Lubrication Guide."
- (5) Flush out the crankcase with Diesel fuel; solvent, dry cleaning; or kerosene and fill it with the proper grade of lubricating oil specified in the "Lubrication Guide."

- (6) Drain the oil from the injection pump and refill to proper level with specified lubricating oil. (Refer to "Lubrication Guide.")
- (7) Before starting engine be sure filters have new elements.
- (8) Remove tin can from exhaust pipe.
- (9) Install spark plugs.
- (10) Fill cooling system.
- (11) Fill fuel tanks.
- (12) Start the engine and let it run slowly. Observe if any valves are sticking. If so, pour a small quantity of Diesel fuel; solvent, dry cleaning; or kerosene on the valve stem until the valves become loose.
- (13) Assemble valve housing cover.

CAUTION! Do not accelerate the engine rapidly or operate at high speed immediately after starting.

### STEERING BRAKES

The steering brakes are 17" external contacting bands on the steering clutch drums.

### ADJUSTMENT

(See Illusts. 1 and 2.)

The adjustment for wear is done by turning the brake rod adjusting knobs "A" on each side (located under the dash just above the engine frame side channels) clockwise until the desired pedal travel is obtained.

When adjustment can no longer be made with knobs, turn the knobs counter-clockwise until about linch of the threads are covered, Then remove the brake inspection cover, under the rear section of the main frame on each side of the tractor. Adjust the brake band set screw "E" to give 1/64 of an inch clearance between the steering clutch drum and the lining at that point and lock the set screw. Loosen the jam nut "B" and turn the steering brake band adjusting bolt "C" until 1/64 of an inch

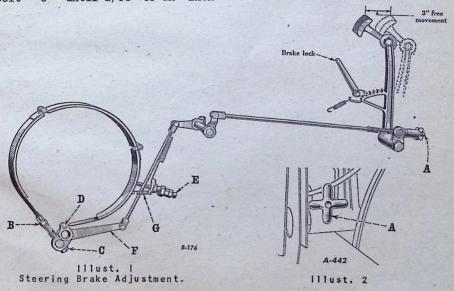
clearance is obtained between the steering clutch drum and the brake lining at all points. Lock the jam nut "B", replace the covers and adjust the knob "A" to give 3-inches free pedal movement.

Subsequent intermediate adjustments can be made with the adjustment knobs "A".

### BRAKE LINING RENEWAL

(See Illusts. 1 and 2.)

Release the tension on the adjusting knob "A". Remove the covers from the bottom and the rear of the main frame. Remove the set screw from the brake band pivot shaft and slide the shaft far enough into the main frame so as to remove it from the pivot arm "F". Back up the adjusting set screw "E". Unhook the spring "G" from the brake band. Remove the brake band adjusting bolt "C", pin "D" and pull the brake band from the drum. Reline the bands and replace them by reversing the above procedure; then, adjust as described above.



### OPERATIONS SECTION

### MEMORANDA

### CHASSIS SERVICE OPERATIONS (MINOR)

### STEERING CLUTCH COMPARTMENT AND CLUTCH HOUSING DRAINS

NOTE: If operating the tractor in water, under very wet conditions, or under extremely dusty conditions, water or dust might come in through the holes in the drain plugs on the engine clutch and steering clutch compartments. To avoid this, replace these plugs with solid plugs which have no holes.

These solid plugs should be removed after every 64 hours of operation to allow any oil accumulation to drain out.

### TRANSMISSION AND SPROCKET DRIVE GEAR CASES

The oil in the transmission case and in the final drive housings should be changed at the interval. specified in the "Lubrication Guide. "

If the oil in the transmission case and in the final drive housings has been thinned with kerosene for operation in temperatures below Zero, the oil should be changed before the weather becomes hot.

proper lever with approved lubricant. (Refer to "Lubrication Guide.")

### TO WASH TRANSMISSION

Fill the transmission case and the sprocket drive gear cases to the proper level with Diesel fuel; solvent, dry cleaning; or kerosene. Operate the tractor in low gear for a few minutes, then remove the drain plugs and allow time for complete drainage. Replace the plugs and fill to the proper levels with fresh lubricant. (Refer to "Lubrication Guide").

### REPLACEMENTS OF MAIN FRAME PARTS

When making replacements of parts in the main frame, the old oil should be thoroughly washed out to remove all sediment, etc.; then, refill with new oil. It is important that this be done as foreign matter, such as very fine dirt, etc., will not separate from the old oil by settling.

### SETTING BEVEL GEAR DEFLECTION SET SCREWS

Screw in snug (by hand) against highest point of the gear (turn gear to determine this high point) and back off 1/4 turn. If feeler gages are used, .020-inch is the recommended clearance between the Remove the drain plugs and drain recommended clearance between the the oil while it is warm. Allow set screw and the high point of time for complete drainage, then replace the plugs. Refill to the after the adjustment has been made.

### OPERATIONS SECTION

MEMORANDA

### 17" CLUTCH (OVER-CENTER TYPE)

### CARE OF THE CLUTCH

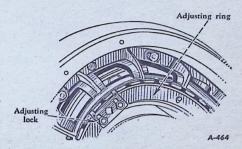
This over-center clutch is designed so that it requires a minimum of attention. It is important, however, that instructions for lubricating, as given on "Lubrication Guide," are followed.

### OPERATION AND ADJUSTMENT

- (1) The clutch is fully engaged when the engine clutch hand lever is pulled back all the way to a point where the full over-centered engagement is definitely felt.
- (2) The clutch should be adjusted when there is a noticeable slippage while the tractor is operating under load.

### TO ADJUST

- (A) Remove the clutch inspection cover, which is located on the floor plate ahead of the steering clutch levers.
- (B) Loosen the nuts on the adjusting ring lock and disengage the lock from the notches in the back plate.
- (C) With clutch hand lever is disengaged position, turn the adjusting ring in a clockwise direction, moving it one notch, or possibly two notches at the most at any one time. Engage the ring lock in the lock plate. Pull the hand lever back to engaged position as a check to determine if over-center engagement is felt.



Illust. | Adjustment of the over-center clutch.

If adjustment has been made as described, and the cams are so tight that the full over-center engagement is not definitely felt, the adjusting ring should be backed off one notch (in counterclockwise direction).

For satisfactory operation of the clutch do not have clutch adjusted so tight that this full over-center engagement is not easily secured.

The clutch is correctly adjusted when a considerable (not excessive) pressure can be felt when the clutch hand operating lever is pulled back to the engaged position and a definite over-center cam engagement can be felt.

If little or no pressure on end of hand lever is required to engage the clutch, then further adjustment, as outlined above, is necessary.

After the clutch has been correctly adjusted be sure to tighten the nuts on the adjusting ring lock, and then replace the cover plate.

### STEERING CLUTCHES

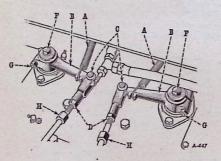
If the steering clutch slips, or if the steering clutch hand lever free movement is less than 2" measured at the handle of the lever), adjustment is necessary.

TO ADJUST (See Illusts. 2 and 3.)

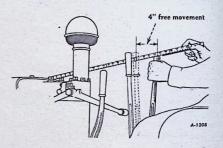
Loosen the yoke lock nuts "D" and the rod by turning nut "H" so as to lengthen the rod. Then tighten the lock nuts "D" against the rods.

Check to see if the free movement of hand lever is 4".

When adjustment can no longer be made by means of lengthening the operating rod, remove the release lever return spring "A" and the operating rod yoke pin "C"; ther remove the steering clutch release



Illust. 2 Steering Clutch Adjustment.



Illust. 3 Adjustment of Steering Clutch Levers.

lever cap screw "F". Loosen the cap screws "G" and pry the release lever off the splined release shaft and turn the right hand release lever clockwise (left hand release lever counter-clockwise) slightly, and replace the lever on the splined release shaft. Then loosen the lock nut and adjust the operating rod until a free movement) of 4" is obtained.

When the desired free movement of the hand lever is obtained, replace and tighten the release lever cap screw "F" and tighten the cap screws "G".

Subsequent intermediate adjustments can be made by means of lengthening rod linkage as described above.

### COOLING SYSTEM

The water is circulated through the engine blocks, cylinder head, and radiator by a centrifugal pump. The temperature of the water is controlled by a thermostat which will not allow the water to flow through the radiator until the engine has reached operating temperature. When the thermostat is closed the water circulates through the engine only.

### TO FILL COOLING SYSTEM

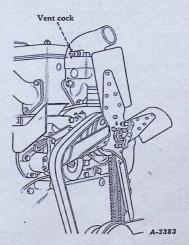
The water capacity of this tractor is approximately 27 gallons (U.S.).

- (1) Close the crankcase and radiator drain cocks (see Illust. 2).
- (2) Open the vent cock in the thermostat housing (see Illust. 1).
- (3) Pour water (soft or rain water, if available) into the radiator until water flows from vent cock. Then close the cock and fill the radiator to a level slightly below bottom of filler opening. This allows for expansion of the coolant under normal operating conditions.
- (4) Do not pour cold water into the radiator if the engine is

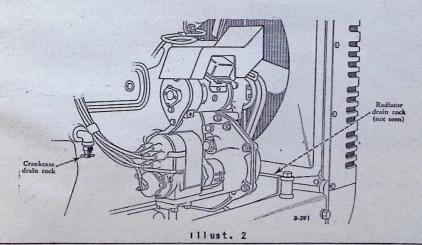
very hot, unless conditions.

\*make it absolutely necessary,
in which case, start the engine
and let it idle, then slowly
pour the water into the radiator.

(5) If the engine is to be operated in freezing temperatures, refer to "COLD WEATHER OPERATION" on page 12, Section G.



Illust. I Showing Thermostat Housing Vent Cock



### COOLING SYSTEM

### TO CLEAN OUT DIRT AND SLUDGE

- (1) Drain the cooling system by opening the radiator drain cock and crankcase drain cock. Allow the system to drain and close the drain cocks. (See Illust. 2.)
- (2) Fill the cooling system with a solution of 7 to 8 pounds of ordinary washing soda, mixed with 27 gallons (U.S.) of water (cooling system capacity).
- (3) Leave the radiator filler cap off and run the engine until the water is hot, then drain and flush with clean water.

### RADIATOR CORE

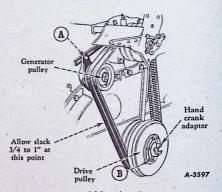
Overheating is often caused by bent or clogged radiator fins. If the spaces between radiator fins become clogged, clean them with an air or water hose. When straightening bent fins be careful so as to not injure the tubes, or break the bond between the fins and the tubes.

A-981-B

Illust. 3 Checking the Fan Belt Tension.

### FAN BELT TENSION

The slack of the fan belts should be checked frequently to assure maintenance of the correct tension. The tension is correct when the belts can be depressed without effort by the thumb, approximately 3/4 to 1-inch midway between the generator and drive pulleys as shown in Illusts. 3 and 4. If the slack is more than 1-inch, adjust belt as follows:



Illust. 4 Adjusting Fan Belt.

### TO ADJUST FAN BELTS

To adjust, loosen the nut "A" on generator pulley bracket (see Illust. 4). After adjusting belts to correct tension, tighten nut.

Also check to see that the other nuts which hold the bracket in place are tight.

After a new belt has been run approximately 64 hours, check the tension and adjust if necessary.

Having "V" belts tighter than the specified tension results in rapid wear.

### COOLING SYSTEM - Continued

### REMOVING THE FAN BELTS

To remove the fan belts, loosen nut "A" (see Illust. 4) and slack the belts by moving the generator bracket. Slip the belts over the fan pulley and blades, slip them over the drive pulley, and then disassemble the hand crank adapter by removing six nuts at "B".

NOTE: If the tractor is equipped with a front power take-off, it will be necessary to remove the power take-off shaft, which replaces the hand crank adapter.

### REPLACING THE FAN BELTS

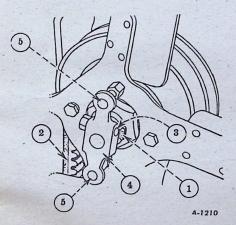
Reverse the procedure outlined under "Removing the Fan Belts". Adjust the tension of the belts as shown in Illusts. 3 and 4, and tighten the nut "A".

New belts should be installed in pairs when the old ones become soaked with grease, or so badly worn that they do not drive the fan at the proper speed.

### WATER PUMP PACKING

The pump may leak due to wear after considerable service. If this occurs, tighten the packing nut (1) (see Illust. 5) just enough to stop the leaking.

To install new packing remove driver pin (3) and driver (4). Unscrew and remove packing nut (1) and place new water pump packing around shaft. Then reassemble the packing nut, driver, and driver pin.



Illust. 5

- (1) Water pump packing nut.
- (2) Fan belt.
- (3) Driver pin.
- (4) Driver.
- 5) Stud.

### OPERATIONS SECTION

### MEMORANDA

### ELECTRICAL EQUIPMENT

### WIRING DIAGRAM

The wiring diagram, which is shown in the *Electrical Section of the Spare Parts Catalog*, can be used as a guide in identifying the various electrical units, and for tracing the electrical cables and connections.

### PRECAUTIONS:

CAUTION! Before working on any part of the electrical system, disconnect the battery ground cable. Do not reconnect this cable until all the other equipment has been connected. This will avoid shorting and causing damage to any of the electrical units.

NOTE: Do not run generator until battery charging circuit, and the lead from the "A" terminal to the "GEN" terminal are connected.

DANGER! The generator will burn out if operated with any wires of the charging circuit disconnected or broken. If it is necessary to operate the generator without the battery, remove the connection from the "GEN" terminal on the relay and ground it on the relay mounting screw, or remove the generator field cable from the "F" terminal on generator frame.

Be sure all the terminals are clean and securely fastened. Make sure there are no broken wires anywhere in the electrical circuit.

Tractors shipped with electrical attachments have the battery ground cable disconnected at the battery end, and in addition, the connection at the "F" terminal on the generator frame is not completed.

Before starting the tractor, connect the "battery to ground" cable and the generator wires.

### STORAGE BATTERIES

### CARE OF BATTERIES

To prevent failure of batteries it is important that the electrolyte in the batteries be kept at the proper level at all times.

Keep the vent hole in the battery filler caps open.

Inspect the battery once a week or oftener to keep the water at the correct level and to maintain the correct specific gravity. The specific gravity reading of about 1.250, corrected to 80° F. should be maintained. (See Chart "VARIATION OF SPECIFIC GRAVITY WITH TEMPERATURE" on page 4.)

CAUTION: If water is added to the battery when the temperature is near the freezing point (32° F.) always run the engine long enough to mix the water and the electrolyte so the water in the battery will not freeze.

Acid or electrolyte should never be added except by a skilled battery man. Under no circumstances add any special battery "dopes," solutions or powders.

The electrolyte in each cell should be 3/8-inch above the separators. When the electrolyte is below this level, pure distilled water should be added. Never use hydrant water, or any water which has been in a metal receptacle. Keep a glass jar of pure distilled water on hand for battery use only. Use a clean syringe to put the water into the battery cell.

### OPERATIONS SECTION

### ELECTRICAL EOUIPMENT - Continued

The battery cable terminals must be clean and tight. Use hot water to remove any terminal corrosion, and also for cleaning the top of the battery. Brighten the terminal contact surfaces with wire wool, apply a light coat of vaseline, and reassemble. Be sure the terminals are clamped tightly, and be sure the battery is clamped securely in the battery box. If this is done two or three times a year you should have no trouble from corroded terminals.

Batteries, when shipped dry, should be serviced in accordance with the instructions on the tag attached to the battery.

### GENERATOR AND LIGHT SWITCH

The generator has an adjustable third brush for changing the charging rate. It also has a light switch with a field resistance control for regulating the charging rate of the generator from the instrument panel.

The light switch is used to control the generator field resistance and has four positions; Low-Charge, High-Charge, Dim and Bright.

When the lights are turned on to either the dim or bright positions the field circuit is direct to the ground giving high-charge or increased generator output. This is also true when the switch is in the high-charge position.

During the daytime when lights are not used, the switch should be put in the low-charge position. This adds a resistance coil to the field circuit and reduces the output of the generator to approximately one-half its original charge rate. If the charge in the battery is low, the switch should be placed in the high-charge position until the bat-

tery has a full charge as indicated on Specific Gravity Chart on page 4.

### GENERATOR COMMUTATOR (See Illust. 1)

If the commutator is dirty or slightly burred it can be polished with a strip of No. 00 sandpaper. Never use emery cloth.

### TO CLEAN COMMUTATOR

The commutator can be cleaned by placing a strip of sandpaper between the brush and the commutator while the armature is revolving. After the polishing operation all dust must be blown from the commutator. If the commutator is very rough or out-of-round it should be referred to the proper maintenance personnel.



A-981- C

Showing the Method of Cleaning the Commutator by using No. 00 Sand-paper, never use emery cloth.

### ELECTRICAL EQUIPMENT - Continued

### TO ADJUST CHARGING RATE BY THIRD BRUSH - See Illusts, 2 and 3

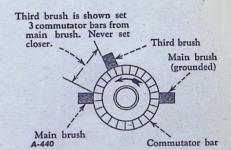
"C" and the cover band loosen the round head screw "A" on the commutator end bearing casting until the lock washer tension is released. Do not attempt to remove the screw. Change the charging rate by moving the third brush "B". (this brush is the one mounted on a movable carrier, whereas the other main brushes are mounted directly on the end bearing casting). The rate of charge is increased by moving the third brush in the direction of rotation of the armature and decreased by moving it in the opposite direction.

The maximum rate of charge for the generator (with the switch in the high-charge position, and with no electrical load) is 6 to 8 amperes

Illust. 2 Generator showing Third Brush

when "hot" and 8 to 10 amperes when "cold". DO NOT SET BEYOND THESE LIMITS. The battery should be fully charged when checking the maximum generator output.

IMPORTANT! The third brush should never be set closer than three commutator bars from main brush (see Illust. 3).



View showing Commutator End (Brush Setting)

When all adjustments are completed be sure to tighten the round head screw "A", which locks the third brush carrier in place. Reassemble the cover band "C" with the joint on the bottom of the generator so that the joint is not over any opening.

CAUTION! All adjustments should be made by proper maintenance personnel.

# Variation of Specific Gravity with Temperature

# Consult This Chart

Read the thermometer in the battery acid—read the Hydrometer—then at the top of the table find the column headed by the temperature which is nearest the battery acid temperature; find, in that column, the figure nearest the observed Specific Gravity reading, and trace horizontally across to the 80° F. column. The 80° F. figures are the true acid gravity and should form the basis for any acid adjustment.

The specific gravity of acid in fully charged batteries should not exceed the value specified by the manufacturer (base temperature 80° F.). If hydrometer readings are taken at acid temperatures other than 80° F., allowance must be made for temperature.

All figures in horizontal lines represent the same state of charge but at the various temperatures shown in the column headings; that is, 1.280 Specific Gravity at 80° F. (the base temperature) becomes 1.268 when Electrolyte temperature is 10° F., and 1.312 when Electrolyte temperature is 0° F.

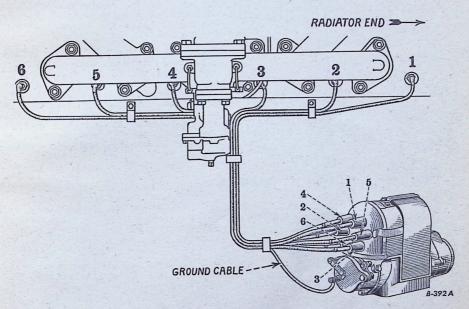
TO SECTION	
120° F.	1.127 1.137 1.146 1.156 1.165 1.175 1.205
110° F.	1.131 1.150 1.159 1.179 1.179 1.239 1.238 1.248 1.248 1.248 1.248 1.248 1.248 1.248 1.248 1.248 1.248
100° F.	1.134 1.143 1.163 1.163 1.173 1.223 1.243 1.252
90° F.	1.137 1.147 1.166 1.166 1.176 1.227 1.217 1.246 1.246 1.246 1.266 1.266 1.266 1.266 1.266 1.266 1.306 1.306
80° F. I	1.140 1.150 1.170 1.190 1.200 1.200 1.200 1.200 1.200 1.200 1.200 1.200 1.200 1.300 1.300
70° F.	1.154 1.154 1.154 1.193 1.234 1.234 1.234 1.244 1.244 1.244 1.244 1.244 1.244 1.244 1.244 1.244 1.244 1.244 1.244 1.264 1.374
60° F.	1.147 1.157 1.167 1.177 1.197 1.238 1.248 1.248 1.268 1.268 1.268 1.288 1.288 1.298 1.398 1.318
50° F.	1.150 1.170 1.180 1.191 1.232 1.232 1.252 1.252 1.252 1.262 1.302 1.302 1.312 1.323
40° F.	1.154 1.164 1.184 1.204 1.236 1.256 1.256 1.266 1.266 1.266 1.306 1.306 1.316 1.336
30° F.	1.157 1.167 1.187 1.188 1.198 1.238 1.239 1.259 1.269 1.260 1.280 1.300 1.320 1.320
20° F.	1.374 1.334 1.334 1.334 1.334 1.334 1.334 1.334 1.334 1.334 1.334
10° F.	1.163 1.255 1.255 1.255 1.257 1.257 1.257 1.258 1.308 1.318 1.328 1.338
0° F.	1.167 1.173 1.173 1.229 1.239 1.239 1.241 1.312 1.322 1.332 1.332 1.332 1.332 1.332

With battery fully charged and on charge at the normal rate, the cell voltage will be about as follows:

Average cell voltage at 80° usually falls between 2.5 and 2.7 volts. Average cell voltage at 100° usually falls between 2.4 and 2.6 volts.

For accuracy always take acid temperature when reading specific gravity.

### SPARK PLUGS AND CABLES



Illust. 4, Wiring plan (for F-6 Magneto).

Firing order is 1, 5, 3, 6, 2, 4, beginning at water pump end of engine.



Illust. 5 Checking the Gap between the Points. Gap should be .035 to .040-in.

### SPARK PLUGS

The spark plugs best suited for this engine are the Champion No. 44 or AC No. 18 and should be used ordinarily. Use only a complete set of either type of spark plug.

The spark plugs should be removed at the proper interval, as shown under "Periodic Inspections" page 14, Section G, or oftener if necessary for cleaning and checking gaps between electrodes. A gap of .035-inch to .040-inch should be maintained (a gage of this thickness is furnished). When making this adjustment, always bend the outer electrode, never the center

### OPERATIONS SECTION

### SPARK PLUGS AND CABLES - Continued

electrode as it may damage the insulator. If the gap between the electrodes is too great, due to improper setting or burning off the ends, engine will misfire and be hard to start.

### CLEANING SPARK PLUGS

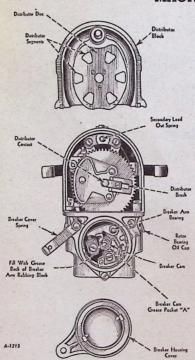
Sand blasting is the recommended method of cleaning spark plugs. Never scrape or clean the insulator with anything which will scratch the porcelain. Scratched porcelain allows carbon and dirt to accumulate much faster.

### SPARK PLUG CABLES

If spark plug cables are removed for any reason, note the position of each cable on magneto. (Wiring Chart - Illust. 4, shows correct wiring.)

There should be 1/4-inch minimum clearance between the spark plug cables and the cylinder head. By maintaining this clearance, shorting-out the spark plug will be prevented and the cable will be away from the extreme heat of the cylinder head. If the cable touches the head, heat soon causes the rubber to become soft and ruins the cable.

### MAGNETO



Illust. 6
Detail of Magneto Distributor
and Breaker Mechanism.

The engine is equipped with the International F-6 Hagneto with Automatic Impulse Starter Coupling. Hagneto used for starting only.

The magneto is always permanently engaged and the spark is automatically eliminated by means of the ground (cut-out) switch when operating on the Diesel cycle.

### LUBRICATION (See Illusts. 6, 7 and 8.)

Every 64 hours of operation, oil the impulse coupling oil cup (5) liberally with the grade of oil specified in the "Lubrication Guide."

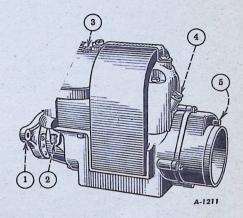
At the interval specified in the "Lubrication Guide" remove the distributor block (see Illust. 6) and clean the inside of distributor block and face of the distributor disc with a clean cloth moistened with Diesel fuel; solvent, dry cleaning; or kerosene; then wipe dry. Moisten a cloth with "OE" engine oil and apply a light coat on the surface of the distributor disc.

CAUTION: Be careful not to damage the carbon brush.

#### MAGNETO - Continued

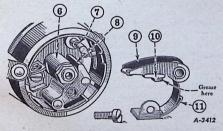
Take off the breaker housing cover (1), at the interval specified in the "Lubrication Guide", and remove the circuit breaker assembly (9). Wipe all parts clean of old grease. On the cam surface (6) apply a thin film of the grade of grease specified in the "Lubrication Guide". Pack a small quantion Guide". Pack a small quantity of the same grease on the breaker arm post (7), in pocket of breaker cam (8), and on the breaker arm rubbing block (10). Wipe the breaker arm spring (11) with a cloth dampened with "OE" engine oil to prevent rust.

Fill the distributor bearing oil cup (3) with oil and also apply a few drops of oil in the rotor bearing oil cups (2) and (4). (Follow the "Lubrication Guide" for the grade of oil to use and the interval of lubrication.)



Illust. 7

- Breaker housing cover.
   Rotor bearing oil cup.
  - Distributor bearing oil cup.
- Rotor bearing oil cup.
- Impulse coupling oil cup.



Illust. 8 Circuit Breaker

- Breaker cam.
- Breaker arm post. Breaker cam felt.
- Breaker arm.
- Breaker arm rubbing block.
- Breaker arm spring.

#### MAGNETO - Continued

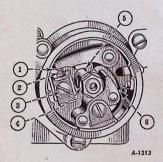
#### BREAKER POINTS

The breaker points should be inspected at the proper interval specified under "Periodic Inspections," page 14, Section G, for adjustment and general conditioning. The point opening should be .020-inch (when rubbing block is on high point of cam). A gage of this thickness is furnished in the tool equipment.

#### TO ADJUST POINTS

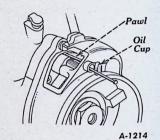
Remove the circuit breaker cover (1) see Illusts. 6 and 7 and disengage the coupling by inserting a rod or wire into the coupling oiler, and lifting the pawl, see Illust. 10. Crank the engine until the rubbing block is on the high point of the cam.

Insert the gage between breaker points (1) and (2) see Illust. 9. If the points are too vide, or too close, loosen screw (3) slightly. Adjust so the gage will slip snugly into the opening. Tighten screw (3) and recheck the opening. Use a screwdriver as a pry to move the point support.



Illust, 9 Breaker Mechanism

- 1) Breaker arm point.
- 2) Adjustable breaker point.
- 3) Point support screw.
- 4) Cam.
- (5) Rubbing block.
- (6) Breaker arm spring.



Illust. 10 Method of Disengaging Impulse Coupling.

#### IF POINTS ARE ROUGH OR PITTED

Remove both points and dress them with a sharp fine file. If they are worn excessively replace them with new ones and adjust them as described previously.

#### TIMING THE MAGNETO TO THE ENGINE

If the magneto is to be removed the following instructions must be closely followed when replacing the magneto onto the engine:

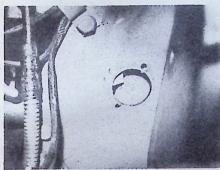
#### ENGINE

Set the compression release lever in low-compression position for gasoline operation. Crank the engine until the No. 1 piston (the piston next to the starting crank) is on the upper dead center of the compression stroke (the compression stroke can be determined by removing the No. 1 spark plug, placing the thumb over the opening and cranking the engine until an outward pressure is felt).

Continue cranking until the D.C. 1-6 mark on the flywheel is in line with the pointer on the right side of the rear engine support (the pointer can be seen by remov-

#### MAGNETO - Continued

ing the plate on the right hand side of the rear engine support, above the starting motor, see Illust. 11).



A-981 - A

Illust. II Showing the "D.C." mark on the Flywheel.

Fully retard the spark by raising the breaker housing cover as high as it will go. To do this, remove the nut "A" and link "B", as shown in Illust. 12, then carefully remove the breaker housing cover so as to avoid moving the breaker cam.

#### MAGNETO

The impulse coupling should then be locked out of engagement by inserting a rod or wire into the oiler hole and lifting the pawl (see Illust. 10).

Rotate the magneto clockwise (as viewed from coupling end) until the rubbing block in breaker assembly is on the high point of the cam. Check or adjust the point opening to proper setting .020-inch.

Assemble the magneto and drive coupling parts on the engine bracket. Insert the magneto base screws loosely into the magneto.

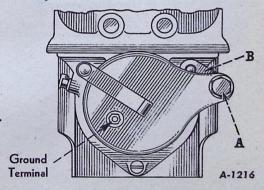
NOTE: Do not use screws which are longer than the originals as they will damage the magneto.

Remove the distributor block (see Illust. 6). Grasp the magneto half of the adjustment block (see Ref. No. 4, page 25, Section 3 of the Repair Section). Rotate it clockwise (as viewed from the coupling end) until the brush in the distributor disc is under the distributor block terminal marked "No. 1," and the breaker points are just beginning to open.

With the magneto in this position, locate the two holes in adjustment coupling that align. Insert shims between the two halves of the coupling so the cap screws will pass through the holes in the shims and enter the holes in the tapped half of the adjustment coupling.

NOTE: The holes in the adjustment coupling are so spaced that only two pairs of holes will line up exactly. Do not force the cap screws as the setting will be incorrect.

Tighten the magneto base cap screws and replace the circuit breaker cover and distributor block. Be careful to not damage the brush or contact spring.



Illust. 12
Breaker housing cover
with timing link and
ground terminal.

#### MAGNETO - Continued

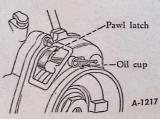
#### TO CHECK THE TIMING

- (1) Fully retard the spark.
- (2) Remove the circuit breaker cover (see Illust. 12).
- (3) Crank the engine until the breaker points are just beginning to open. If the timing is correct, the D.C. mark on the flywheel will align with the timing pointer on the left side of the rear engine support. (See Illust. 11).

# TO CHECK TIMING WITH IMPULSE ENGAGED

- (1) The impulse coupling should be engaged manually by inserting a small rod or wire into the oiler hole (see Illust. 13) and lifting up on the latch.
- (2) Crank the engine slowly until the impulse trips.
- (3) The D.C. mark on the flywheel should be in line, or not more than 8° below (1-inch on flywheel rim) and never above the timing pointer on the rear engine support. (See Illust. 11.)
- (4) The engine firing order is 1, 5, 3, 6, £, 4 beginning at the radiator end of the engine.
- (5) Attach the spark plug cables to the engine and magneto. Start

- by connecting the No. 1 cylinder spark plug to socket marked "1" on the distributor block. Advancing clockwise on distributor block, connect the next socket with No. 5 cylinder; next with No. 6 cylinder; next with No. 6 cylinder; next with No. 2 cylinder, and the last with No. 4 cylinder. (See "Magneto Wiring Diagram," Illust. 4).
- (6) Be sure the cable terminals are pushed all the way into the distributor block sockets, and that they make good contact, otherwise a green coating will form in the hole.
- (7) The magneto is now correctly wired and timed.
- (8) When replacing the sheet metal impulse cover, be sure that the joint is lapped.
- (9) The magneto impulse cover should always be assembled with the hole on the bottom to facilitate drainage in damp or rainy weather.
- (10) When operating under extremely dusty conditions, the flap over the hole should be partially closed to prevent the entrance of excessive dust.

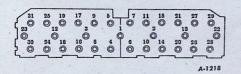


Illust, 13 Method of Engaging Impulse Coupling

### ENGINE SERVICE OPERATIONS (MINOR)

#### CYLINDER HEAD GASKET

For the most satisfactory results in tightening the cylinder head after installing the cylinder head gasket, tighten all nuts fairly snug, starting with the row on the center line then going to the others. Retighten in the same order, giving each nut a small part of a turn at a time. Continue this until all the nuts are tight. Do not screw one nut down perfectly tight and then go to the next as you will not secure an even pressure on the gasket in this manner.



Illust. L Showing the proper Sequence for tightening the Cylinder Head Nuts.

After replacing the cylinder head, it is necessary to assure against leaks by retightening the stud nuts after the engine has been run and the water jacket becomes throughly heated. To tighten the nuts properly, the valve rocker shaft assembly must be raised.

Be sure to adjust the valve tappet clearance after the last tightening of the cylinder head stud nuts (see "Valve Adjustment" on page 4).

# REMOVING CYLINDER HEAD OR VALVES

Whenever the cylinder head or the valve mechanism has been removed, care must be taken when they are replaced that valves are not damaged by coming into contact with the top of the piston, or through improper adjustment of the valve

lever screw by being pushed down too far into the cylinder sleeve. To prevent this, always loosen the valve lever screw clear up and bring the piston to the top center of the compression stroke. Then screw down on the adjustment screw until the proper clearance is obtained.

After replacing the cylinder head, check to see that there is a clearance of not less than .185-inch, or more than .205-inch, between all six starting valve covers and starting valve shaft cam rollers, in Diesel position. If the clearance is incorrect, readjust.

#### REMOVAL OF PISTONS

If the pistons are to be removed from the crankcase, care must be taken to see that each part is reassembled in its original place and position. To assist in this operation, pistons, connecting rods and connecting rod caps are marked with the corresponding cylinder number 1, 2, 3, 4, 5, and 6, and the cylinder numbers are also marked on the bottom flange of the crankcase.

Each piece should be reassembled so that the numbers correspond. Also, all the numbers should be on the same side of the assembly as the number on the crankcase flange indicates.

#### IRREGULAR FIRING OF ENGINE

The bleeder valves at the top of the injection nozzles at the cylinder head should be opened only in case of irregular firing caused by entrapped air in the injection lines, or if the engine is continuously noisy in one cylinder. Opening the bleeder valve will locate the noisy cylinder and usually indicate a faulty injector.

(See Instructions on page 4, Section 7, for venting fuel system).

#### AIR CLEANING SYSTEM

It is very essential that the oil cup be cleaned and filled regularly with new oil.

#### OIL CUP

Clean and refill the oil cup every day or after every 8 hours of operation (more frequently under severe dust conditions). Refill the oil cup to the oil level bead with same grade oil as used in the engine crankcase. The capacity of the oil cup is 6-3/4 pints (U.S.).

Before removing the oil cup, clean or wipe the oil or grit from the top bead of the oil cup, oil cup retaining clamp and the surface under the clamp.

#### AIR INTAKE CAP AND TOP CASTING

The air intake cap is provided with an inlet screen which prevents large particles, such as chaff, leaves, etc., from entering the air cleaner.

Keep this inlet screen clean. The holes must be free from paint and must be kept open at all times. Dust, oil or water may collect on the screen and clog up the holes enough to restrict the flow of air to the engine. Restricted air flow will reduce the horse-power delivered by the engine.

The air intake pipe, from the intake cap to the air cleaner, should not be allowed to collect dirt on the inside. Clean this pipe when the air cleaner is removed, and at the same time, clean the inlet tube through the air cleaner.

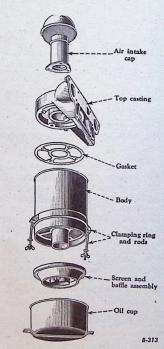
Also, thoroughly clean out inside of the top casting.

#### WASHING THE CLEANER

After every 64 hours of operation, particularly if operating the tractor in an atmosphere heavily laden with dust, chaffor lint, re-

move the entire air cleaner from the tractor and completely disassemble it. Wash the parts thoroughly in Diesel fuel; solvent, dry cleaning; or kerosene. Be sure to clean out the air intake pipe, also thoroughly clean out the inside of the top casting.

After all the parts have been thoroughly cleaned, replace the air cleaner body on the tractor. Make sure all the joints are airtight, then replace the air intake cap. Fill the oil cup to the proper level with the specified grade of oil and replace it on the air cleaner. Be sure it is held securely in place by the cup clamps.



"Exploded" View of the Air Cleaner Removed from the Tractor.

#### AIR CLEANING SYSTEM - Continued

Replace the air cleaner. Make sure all the joints are air tight and be sure the screens are held firmly in place. Replace the air intake cap and replace the oil cup after it is properly filled with oil. Make sure the oil cup is held securely in place by the cup clamp.

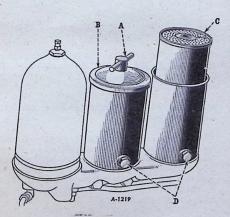
#### GENERAL PRECAUTIONS

To prevent the entrance of dirt into the engine, it is absolutely essential that frequent inspections be made of the flexible

rubber connections to the carburetor and air cleaner. The flexible connections should be replaced before they deteriorate. To
eliminate any undue strain on the
connections, make sure the pipes
line up. See that all the joints
between the air cleaner and the
cylinders of the engine are tight,
this includes the flexible connections, carburetor and manifold joints, and gaskets. All the
gaskets must be in good condition
and the bolts should be drawn up
tight.

### LUBRICATING OIL FILTERS (Two) (Absorption Type)

The life of your engine depends upon clean oil being circulated to all bearings. Every good operator knows that minute particles of abrasive matter eventually accumulate in the crankcase of the engine, and that in the normal course of engine operation, the lubricating, oil undergoes changes which produce sludge, acids, gums, varnish, and other harmful by-products.



Illust. 3

The purpose of the oil filter is to separate and remove the dirt and other foreign substances from the oil to prevent these injurious materials from being circulated to the engine. The oil filter elements should be replaced at the time engine oil is changed as specified in the "Lubrication Guide."

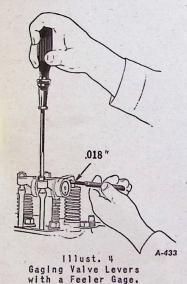
Close adherence to the simple, common-sense procedure for keeping dirt and oil impurities away from precision-made engine parts will safeguard your engine against undue wear and the operating troubles and upkeep expense which are a natural result of that condition.

The oil filter elements are housedin the rear two shells of the group of three on the left side of the engine.

To replace elements, loosen the bar nuts "A" on top of the two shells and remove the caps "B" over the shells. Remove old elements "C". Remove drain plugs "D" to allow oil to drain out. Replace with new elements; then replace the caps, tightening the bar nuts by hand only.

#### VALVE CLEARANCE ADJUSTMENT

Check the valves for clearance every 500 to 512 hours and adjust the clearance if necessary. A clearance of .018-inch is necessary between end of valve levers and valve stems when valves are closed and when engine is hot.



- (1) Before checking valve clearance, ground the magneto by fastening a wire to the ground terminal (see Illust. 12, Section 5) and to a bolt on the crankcase. This will eliminate any danger of accidentally starting the engine.
- (2) Set the compression release lever in low compression position (gasoline operation).
- (3) Remove valve housing.

- (4) Remove spark plug from the No. 1 cylinder (the cylinder next to the water pump).
- (5) Place thumb over the spark plug opening and slowly crank the engine until an outward pressure can be felt. Pressure indicates No. 1 piston is moving toward upper dead center of the compression stroke.
- (6) Continue cranking slowly until D.C. 1-6 mark on flywheel is in line with pointer on injection pump side of flywheel housing. Both valves are now closed on compression stroke of No. 1 cylinder. (See Illust. 11, Section 5).
- (7) Check clearance of No. 1 valves and adjust, if necessary, by following outline below.
- (8) Loosen the lock nut and adjust screw in valve lever so that gage slips snugly between end of valve lever and valve stem (see Illust. 4).
- (9) Tighten lock nut and recheck clearance with gage.
- (10) Crank engine 1/3 of complete turn of crankshaft until D.C. 2-5 mark on flywheel is in line with pointer.
- (11) Check No. 5 valves and adjust if necessary.
- (12) Continue this procedure turning engine 1/3 revolutions at a time and measuring and adjusting clearances of each cylinder's valves in succession according to firing order of engine, which is 1-5-3-6-2-4.
- (13) After all valve levers have been adjusted, remove the wire grounding the magneto.

Important: Be accurate -- use a feeler gage for checking the valve clearance.

#### SUGGESTIONS FOR CHECKING TROUBLE

Study the problem before making any changes.

If any adjustments are to be disturbed, the original setting should be noted, so this same setting may be restored in case the part changed does not remedy the trouble.

#### FAILURE TO START ON GASOLINE:

No gasoline in carburetor. Gasoline supply cock closed. Carburetor choked too much. No spark from magneto. Gears engaged (transmission). Gasoline starting device not set. Condensation on spark plugs.

#### MISSING AND BACKFIRING:

Water in gasoline. Air leaks around intake manifold. Starting valves not properly seated.

# FAILURE TO CHANGE OVER TO HIGH COMPRESSION OPERATION:

Starting valve mechanism sticks.
Injection pump not primed (vent air).
Fuel supply cock closed at tank.
Speed control hand lever not set in proper position.
Fuel supply pump not developing fuel pressure.

#### LACK OF LUBRICATING OIL PRESSURE:

Insufficient amount of oil.
Dirt under pressure regulating
valve.
Oil pump strainer clogged or pump

not working.

Defective oil pressure indicator or pipe lines.

#### LACK OF POWER

Injection pump air bound (vent air from fuel system).
Insufficient fuel, filter clogged, supply pump not working properly. Clutch slipping, exhaust pipe or air cleaner clogged or restricted.

(Also see "Lack of Compression and "Overheating").

#### KNOCKING:

Loose piston pin, connecting rod, camshaft or crankshaft bearing. Broken piston rings or loose pis-

Combustion knock in one or two cylinders generally indicates leaky injection nozzle valve.

General rough running usually due to improper timing of injection. Poor grade of fuel, or water in fuel.

Excessive carbon in cylinder.

#### LACK OF COMPRESSION:

Sticky, dirty, pitted or improperly adjusted valves.
Stuck, worn or broken piston rings.
Worn pistons or cylinder sleeves.
Leaky cylinder head gasket.
Leaky gasoline starting valve.

(Also see "Lack of Oil Pressure").

#### OVERHEATING:

Insufficient amount of water, fan belt slipping, excess load on engine.

Inside of radiator and cylinder block limed up or clogged with dirt.

Outside of radiator or radiator screen covered with dirt or chaff. Lack of oil pressure, or water pump not working properly.
Water pump air bound.

#### ENGINE SMOKES:

Overloaded, injection of fuel too early, lack of compression, poor grade of fuel, piston pumping lubricating oil.

#### EXCESSIVE LUBRICATING OIL CONSUMP-TION:

Oil leaks, pistons pump oil, poor grade of lubricating oil being used, piston rings stuck in grooves.

NOTE: If the injection pump does not perform properly, notify proper maintenance personnel at once.

### MEMORANDA

#### DIESEL FUEL WATER TRAP

Clean fuel is important to successful Diesel engine operation. The fuel is strained and filtered between the tank and injection pump by the fuel water trap and filters.

To clean water trap, close the fuel tank shut-off valve. Clean entire water trap thoroughly on outside to prevent dirt from getting into fuel passages. Remove bolt from water trap top and remove entire water trap from the engine. Loosen thumb nut under water bowl and remove bail strap. Then remove the glass bowl. (It is preferable, if you have sufficient clearance, to remove only the glass bowl for cleaning instead of the entire assembly which would break the seat between the bracket and the trap.) Loosen gasket and pull screen off tube. If screen is dirty, wash screen and glass bowl in Diesel fuel; solvent, dry-cleaning; or kerosene, to remove all dirt and sections. Reassemble screen and gasket. Gasket must be in its proper place and in good condition. Then reassemble glass bowl and strap and tighten thumb nut by hand. Then assemble entire water trap to bracket by tightening bolt.

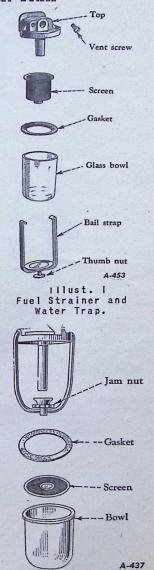
After reassembling, open fuel tank shut-off valve and vent the air by opening the vent screw. See other INSTRUCTIONS FOR VENTING AIR on page 4.

#### GASOLINE STRAINER

CLEANING THE GASOLINE STRAINER AND SEDIMENT BOWL

The gasoline strainer should be cleaned at the interval specified under "Pertodic Inspections," page 14, Section G; to do this, proceed as follows:

- (1) Close the shut-off valve.
- (2) Take the strainer apart by loosening the lower jam nut.
- (3) Clean out the sediment bowl and clean the screen if necessary.
- (4) When reassembling the strainer, be sure the cork gasket between the bowl Showing the Gasoline Strainer and the main body is in good condition and does not leak.



with Glass Bowl Removed for Cleaning.

#### DIESEL FUEL FILTER

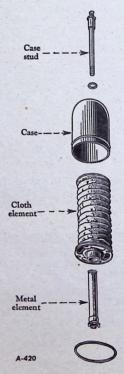
(Combination Cloth and Metal Elements)

The Diesel fuel filter (on the left side of the engine) should be cleaned regularly at the interval specified in the "Lubrication Guide."

#### CLEANING THE DIESEL FUEL FILTER

Remove the case studs and the case. Remove the elements and wash both the metal end cloth elements in Diesel fuel; solvent, dry cleaning; or kerosene.

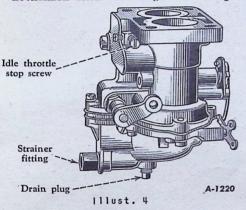
After cleaning the elements, vent the air from the injection system before operating on the Diesel cycle. This can be done as described on page 4.



Illust, 3 Showing the Diesel Fuel Filter Taken Apart for Cleaning.

#### DIESEL STARTING CARBURETOR

The model C-12 Carburetor is used only when starting the engine. The gasoline level is controlled by a conventional float and float valve mechanism when starting and running



on gasoline. The float valve is locked into its seat, shutting off gasoline to fuel bowl when engine changes over to operate on Diesel.

The float valve is protected against dirt and foreign material by a strainer. This strainer should be removed occasionally and cleaned.

NOTE: Periodically, check the screws fastening the fuel bowl to fuel bowl cover and see that cover screws are kept tight to prevent any leakage of air past the fuel bowl cover gasket.

#### TO CLEAN STRAINER

- (1) Close gasoline shut-off valve at gasoline tank.
- (2) Disconnect gasoline pipe at carburetor.
- (3) Unscrew strainer fitting from carburetor, wash off in Diesel fuel; solvent; dry cleaning; or kerosene, and reassemble.
- (4) Open gasoline shut-off valve.

The throttle shaft is so located that when the air passing through the carburetor reaches a certain speed, the air pressure against the throttle butterfly overcomes the tension of the throttle spring and closes the throttle.

The throttle lever comes in contact with the idle throttle stop screw after throttle closes; the position of this stop screw then controls the engine speed.

The starting choke regulates the air for starting.

ADJUSTMENT - (In case Carburetor has been disturbed)

To Adjust Idle Speed

Loosening idle throttle lock screw and turning out idle throttle stop screw reduces speed of engine.

check the. NOTE: In cold weather the idle uel bowl to throttle screw shoulb be readjusted that cover to get correct idling speed.

Engine speed, when operating on gasoline, should not exceed 800 RPM.

Present day grade of gasoline has a tendency to form gum; therefore, it is necessary that gasoline tank and fuel bowlbe completely drained of fuel when engine is to be out of service for more than two weeks. These gum deposits can be completely dissolved with a mixture of one part alcohol and one part benzol, or with acetone.

# VENTING AIR FROM INJECTION NOZZLES, FUEL FILTER AND WATER TRAP

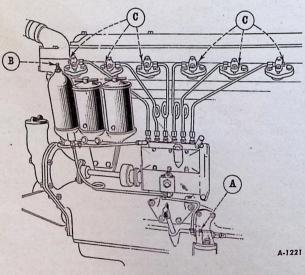
(See Illust. 5)

NOTE: The engine will fail to run on the Diesel cycle if there is any air in the fuel injection system.

To remove the air, it is necessary to bleed the system by opening the vent cocks successively on the water trap, fuel filter and injection nozzles.

(1) With the fuel tank shut-off valve open, open the vent cock "A" on the water trap (with engine stopped).

- (2) Close the vent cock when the fuel starts to flow.
- (3) Open the fuel filter vent cock "B"; then start the engine. With the engine operating on the gasoline cycle, close the vent cock when the fuel starts to flow. Then, advance the engine speed control lever slightly while venting the fuel and injection line.
- (4) Open each nozzle vent "C" individually. Close each cock when the fuel starts to flow.

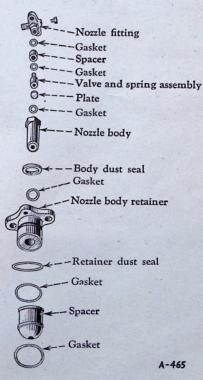


Illust. 5

#### INJECTION NOZZLE

If any cylinder seems to fire too noisily, it usually is an indication that the injection nozzle valve is leaking badly. Clean nozzle and fitting thoroughly with Diesel fuel; solvent, dry cleaning; or kerosene. Remove nozzle and disassemble. A leaky valve will generally appear black. Clean the valve and seat, and wash in Diesel fuel; solvent, dry cleaning; or kerosene.

The nozzle plate should be free of carbon. There should be no carbon in nozzle body spacer.



Illust. 6 Injection Nozzle

#### GOVERNOR

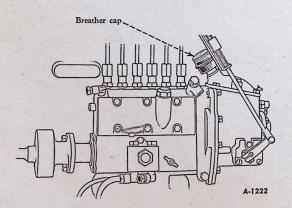
The governor of this engine is an integral part of the fuel injection pump and is fully enclosed and sealed at the factory. It operates in a bath of oil and its function is to maintain the engine speed selected by the operator, and to automatically proportion the fuel to the load.

#### ENGINE SPEED

Never operate the engine at more than the regular governed speed. Excessive speeds are harmful. The rated or maximum full load governed speed is 1200 RPM; maximum idle speed is 1305 to 1355 RPM; minimum speed (hand throttle) is 425 RPM.

#### CLEANING GOVERNOR BREATHER CAP

The breather (See Illust. 7) should be removed and cleaned once a month, or more often if dusty conditions require it. To clean the breather, wash it in Diesel fuel; solvent, dry-cleaning; or kerosene, dip it in engine lubricating oil and replace it after the excess oil has been wiped off.



Illust: 7

#### FUEL INJECTION PUMP AND GOVERNOR

# DO NOT ATTEMPT TO ADJUST PUMP OR GOVERNOR

In case of serious trouble, sufficient to cause failure of the pump to operate satisfactorily, check over instructions regarding cleaning and oiling operations.

Use clean Diesel fuel for good and continuous operation of the Injection Pump.

We recommend, in case of trouble, to replace the entire unit. This should be done by the proper maintenance personnel.

# REMOVING AND REPLACING BOSCH FUEL INJECTION PUMP

#### TO REMOVE INJECTION PUMP

Whenever it becomes necessary to remove the complete fuel injection pump from the engine the following instructions apply:-

#### KEEP ALL PARTS CLEAN

Before removing any fuel lines from the pump, first thoroughly clean the pump and all connections with Diesel fuel; solvent, drycleaning; or kerosene. When the lines are removed the connections on the engine must be covered to prevent dirt from entering the system.

Close the fuel shut-off valve at the main tank. Disconnect all fuel lines leading to the injection pump.

Remove the six injection pump base screws and disconnect the injection pump control rod. Slip the

drive coupling boot over coupling (with use of screw driver), then lift injection pump up from its base.

#### TO REPLACE INJECTION PUMP

Slip the coupling boot over the drive shaft before replacing pump. Assemble pump on its base.

Replace base cap screws; reconnect the injection pump control rod, fuel lines, overflow tube and injection lines. Open the fuel shutoff valve.

Injection pump timing couplings are so made that they can be assembled one way only to give the correct timing of pump with relation to crankshaft.

Start the engine and bleed the fuel system (see page 4).

Reset the injection timing as required (see page 8).

#### INJECTION PUMP TIMING

The injection pump drive has a timing adjustment between drive flange and timing coupling adjuster. The adjustment is normally set with cap screw "A" at center of slot "B" and mark on drive flange "D" at center mark of graduations on timing coupling adjuster "C".

In order to be sure of the best operating condition, which may very on account of local conditions, the adjustment indicator can be tried on either side of center mark "C" and set at the best operating position.

The best location is where engine speed is maximum for a fixed load and engine operation smooth with cleanest exhaust.

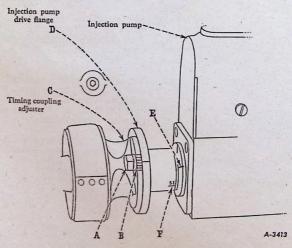
To change location of indicator, loosen cap screws "A" on indicator and turn injection pump to desired position, then tighten cap screws "A".

For advanced position, turn pump flange "D" clockwise. For retarded position, turn counterclockwise.

Timing couplings are so made that they can be assembled only one way for correct timing of pump with relation to crankshaft.

The injection pump is timed for port closing of No. 1 unit. With engine turned over so that No. 1 piston is on the compression stroke, and just before upper dead center, "S.I." mark on flywheel will register with timing indicator on the right side of the rear engine support. In this position the "S.I." mark "F" on injection pump drive flange "D" (at front end of pump) will register with "S.I." mark "E" on front end of pump housing with adjustments in normal position.

NOTE: If front gear cover is off, the letters on gear faces will not register in the above position.



Illust. 8
Injection Pump Coupling Showing Timing

#### GENERAL ENGINE LUBRICATION

The life of any engine depends on the care it is given. Proper lubrication is very important.

This engine has a pressure feed lubrication system.

The engine is equipped with two oil filters which clean the oil continuously while the engine is running. To obtain the full benefit from the filters, the elements should be replaced with new ones every time the oil in the crankcase is changed. (See "Lubrication Guide" for the proper oil change interval.) (Cleaning the old elements is not satisfactory.)

#### OIL LEVEL GAGE

Do not run the engine for any length of time when the level of the oil is below the low mark on the gage.

To test the oil level with the bayonet gage, unscrew the wing nut, remove the gage, wipe it clean and insert it in crankcase until wing nut rests on top of the gage sleeve threads. Do not screw nut onto the sleeve. Remove gage and read oil level. Never check the oil level while engine is running.

#### OIL PRESSURE INDICATOR

An oil pressure indicator indicates the pounds of pressure of the oil circulating through the engine. Under all operating conditions, the pressure of the oil in the engine should hold the indicator in the white section of the gage. Should the indicator not register, stop the engine at once and inspect oil system to find the cause of failure. If unable to find the cause, notify proper maintenance personnel.

Always look at the oil pressure indicator immediately after start-ing engine.

#### OIL PUMP

The gear type oil pump in the crankcase has a screen attached to the oil intake which stops the

large dirt particles from entering the oiling system. This screen should be cleaned whenever the oil pan is removed. The oil intake floats on top of the oil in the crankcase and draws the oil from the surface, thus eliminating the possibility of mixing water or sediment with the oil.

#### IMPORTANT.

Engines shipped to desitnations in the United States of America, Canada and Mexico are filled with thinned SAE-10 oil before leaving the factory. This oil, as shipped from the factory, may be used when operating in air temperatures below zero F. (until the next regular oil change). For temperatures above 0° F., use engine oil as specified under the proper temperature range, in the "Lubrication Guide".

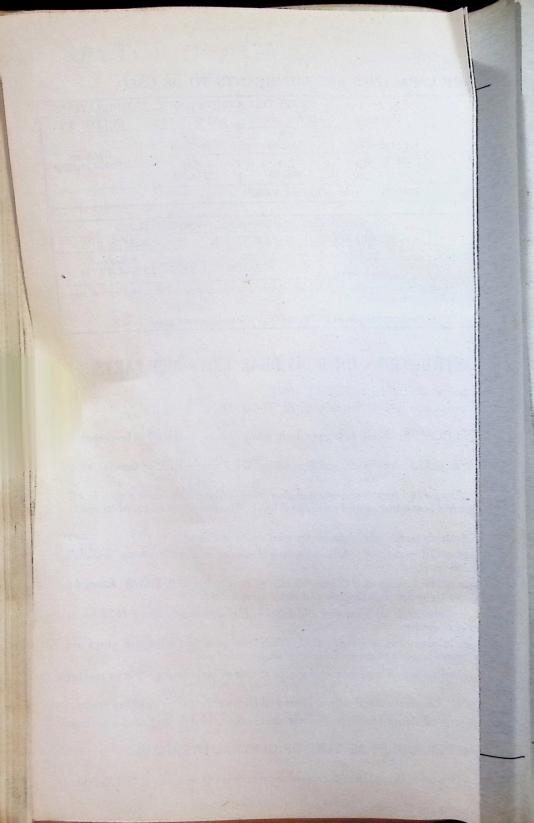
After changing to a lighter grade of oil, the engine should be started and run at least 5 to 10 minutes, so that the lighter oil is worked into the bearings and on cylinder walls.

Change oil at the proper interval, as indicated in the "Lubrication Guide". Drain crankcase lubricant while the oil is warm so it will drain freely. (All lubricating oil is drained from the crankcase of engines for export. (See "Lubrication Guide" for oil to use.)

#### ENGINE LUBRICATING OIL

Engine lubricating oil shall be of well-refined petroleum oils, free from water, sediment, and without admixtures of fatty oils, acids, soaps, resins or any other substance not derived from petroleum. Oil shall not corrode any metal used in engine construction. Also engine lubricating oil containing additive products not necessarily derived from petroleum, but being of noncorrosive type, is satisfactory for use in our engines.

See special instructions for "COLD WEATHER OPERATION" on pages 11 and 12 of Section G.



#### TRACK ASSEMBLIES

If the track chain is too loose it may have a tendency to climb the sprocket when backing the tractor.

When the track adjustment is either too tight or too loose, it causes undue wear on the track links, pins, bushings and bearings, and also on the front idler bearings.

The two heavy coil springs in each track frame are properly set at the factory and require no adjustment. Their purpose is to allow the front idler to recoil under shock but exert no tension on the track when in normal operating position.

On a new unit check the track shoe bolts every 8 hours of operation until it becomes evident that set has taken place. The evidence of set having taken place can be determined when the bolts retain a tightness of 240 to 250 ft. - lbs. The bolts used for attaching the track shoes to the tracks are heat-treated alloy bolts and they will stand considerable tightening strain (common bolts should not be used.)

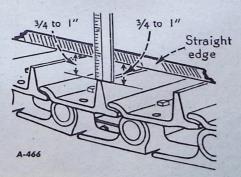
While tightening the bolts it is well to strike the head of the bolt several sharp hammer blows and retighten. As a safety measure

we recommend you use goggles to protect your eyes while striking the bolts.

# METHOD OF CHECKING SLACK IN TRACK CHAIN

To check the slack in the track chain, the chain must be tight everywhere except on the top, tween the front idler and sprocket. This can be accomplished by placing a wooden block, approximately one foot in height, under the foremost track shoe lug; then, with the engine running, put the tractor in low gear and engage the clutch just enough so the sprocket drive tightens the chain along the ground and around the sprocket, After locking the brake and stopping the engine, stand on top of the track chain. Your weight will pull the chain tight around the front idler. All the slack should now be in the top part of the track chain.

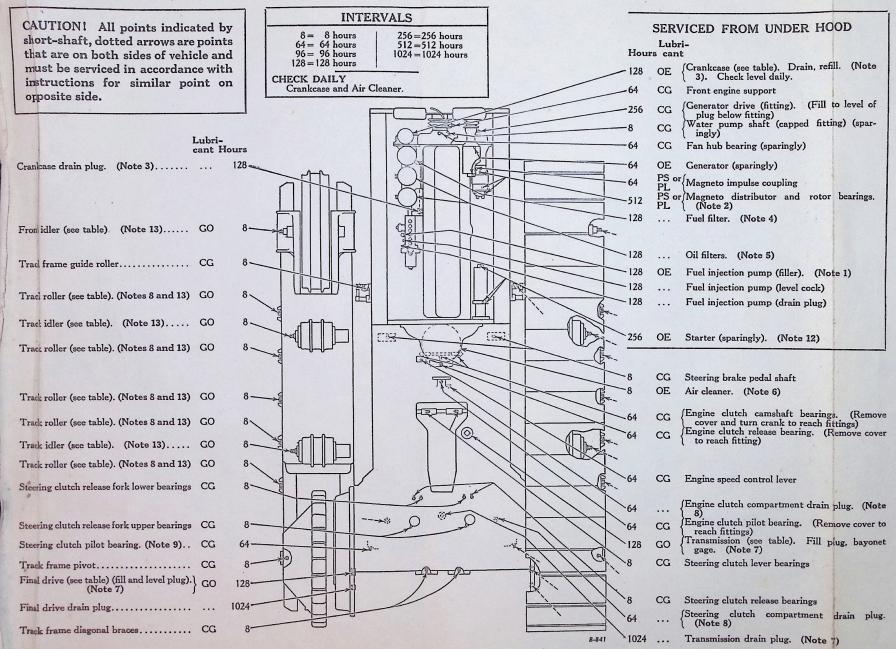
Using a string or a straight edge align the tips of the track shoe cleats across each of the three spans between the top idlers and sprocket and front idler. The sag of the chain under the straight edge of each span should be approximately 3/4 to l-inch. (See Illust. 1).



Illust. I Method of Checking Slack in Track Chain.

INT. 6060. (Insert for INT. 5722A). 1-18-44-2B.

# LUBRICATION GUIDE FOR TD-18 TRACTRA



# TD-18 TRACTRACTOR (For Corps of Engineers)

#### OM UNDER HOOD

see table). Drain, refill. (Note k level daily.

support

rive (fitting). (Fill to level of v fitting) p shaft (capped fitting) (spar-

aring (sparingly)

paringly)

pulse coupling istributor and rotor bearings.

(Note 4)

(Note 5)

on pump (filler). (Note 1)

on pump (level cock) on pump (drain plug)

ringly). (Note 12)

ke pedal shaft (Note 6)

tch camshaft bearings. (Remove turn crank to reach fittings) ch release bearing. (Remove cover itting)

d control lever

ch compartment drain plug. (Note ch pilot bearing. (Remove cover to ings)

on (see table). Fill plug, bayonet lote 7)

tch lever bearings

tch release bearings

on drain plug. (Note 7)

#### KEY TO LUBRICANTS

OE =OIL, engine—crankcase grade

GO = LUBRICANT, gear-universal

CG = GREASE, general purpose
No. 1 (Above +32° F.)
No. 0 (+32° F. to 0° F.)
Refer to EFSB-L-1000D
(Below 0° F.)
Refer to EFSB-L-1000E
(Above +90° F.)

WB2 = GREASE, general purpose No. 2

PL = OIL, Lubricating, Preservative, Light

PS = OIL, Lubricating, Preservative, Special

### TABLE OF CAPACITIES AND LUBRICANTS TO BE USED

UNIT	CAPACITY	EXPECTED ATMOSPHERIC TEMPERATURE			
OIVIT	(Approx.)	ABOVE +32°F.	+32°F. TO 0°F.	BELOW 0°F.	
Crankcase	22 U.S. Qts.	OE SAE-30	OE SAE-10	D.C.	
Transmission	30 U.S. Qts.	GO	GO	Refer to EFSB-L-1000D	
Final Drive (each unit)	5 U.S. Qts.	SAE-90	SAE-80		
HIGH TEMPERATURE: Above +90°F refer to EFSB-L-1000E					

UNIT	EXPECTED	PECTED ATMOSPHERIC TEMPERATURE		
ONIT	+32°F. AND ABOVE	+32°F. TO 0°F.	BELOW 0°F.	
Track Rollers and Idlers and Front Idlers	GO SAE-90 (Note below)	GO SAE-80	Refer to EFSB-L-1000D	

NOTE: If difficulty is experienced with excessive leakage, at operating temperatures +75°F. and above, use "CG" General purpose grease No. 0

at extreme operating temperatures above 100°F. use "CG" General purpose grease No. 1.

### ADDITIONAL LUBRICATION AND SERVICE INSTRUCTIONS ON INDIVIDUAL UNITS AND PARTS

COLD WEATHER: For Lubrication and Service below 0°F., refer to EFSB-L-1000D HIGH TEMPERATURE: For Lubrication and Service above +90°F., refer to EFSB-L-1000E

#### NOTES

- (1) INJECTION PUMP AND GOVERNOR: (FOR BOSCH PUMPS: Every 128 hours drain pump housing and refill to level cock.) (Capacity: 3/8 U.S. Pint.)
- (2) MAGNETO BREAKER ARM RUBBING BLOCK: Every 512 hours pack small quantity WB2 grease back of breaker arm rubbing block and in recess in breaker post.
- (3) CRANKCASE: Every 8 hours check and fill to full level. Every 128 hours drain, when engine is hot. Clean oil strainer screen in oil filler cover. Refill to "FULL" mark on gage. Run engine a few minutes and recheck oil level. Remove cover in guard to reach crankcase drain plug.
- (4) FUEL FILTER: Remove and wash both metallic and cloth elements; also take water trap apart and clean.
- (5) OIL FILTERS: Remove and renew elements when changing OE engine oil. After renewing elements, refill crankcase to "FULL" mark on gage. Run engine a few minutes and recheck oil level.
- (6) AIR CLEANER: Every 8 hours clean and refill oil reservoir to level mark with OE engine oil. (Capacity 6¾ U.S. Pints.) Every 64 hours clean air cleaner lower screen. Keep all connections tight and intake pipe and outer screen clean.
- (7) GEAR CASES: Every 128 hours, with tractor on level ground, check oil level and add lubricant, if necessary. Every 1024 hours drain and refill. When draining, drain immediately after operation.
- (8) MUD AND DEEP WATER OPERATION: Every 4 hours lubricate track rollers. CAUTION! Be sure that solid pipe plugs are
- in engine and steering clutch compartments. Every 64 hours remove plugs to drain any accumulated oil.

  (9) STEERING CLUTCH PILOT BEARING: Fittings reached by removing two round plates at rear of main frame. Move tractor to align fittings with holes.
- (10) FITTINGS: Clean before applying lubricant. CAUTION! Lubricate track rollers, idlers and frame points after washing tractor.
- (11) MISCELLANEOUS POINTS OF LUBRICATION: Every 64 hours lubricate throttle connections, clutch and brake linkage with OE engine oil.
- (12) POINTS TO BE LUBRICATED BY MAINTENANCE PERSONNEL AT TIME OF GENERAL OVERHAUL:
  Starting motor reduction gear compartment.
- (13) BUTTON-HEAD TYPE FITTINGS: Fill with lubricant (see table above) until increased resistance is felt on lever of IHC bucket-type lubricator.
- (14) CLEANING FLUID: Use Diesel Fuel; Solvent, dry cleaning; or Kerosene.

### MEMORANDA

#### TRACK ASSEMBLIES

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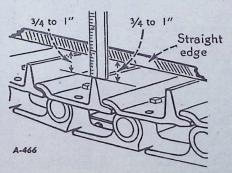
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Illust. I Method of Checking Slack in Track Chain.

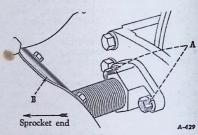
#### TRACK ASSEMBLIES

# TO ADJUST TRACK CHAIN (See Illust. 2)

If adjustment is necessary, remove the small cover plate "B" at the front of the equalizer spring housing and loosen the track spring adjuster lock bolt just inside the housing. Remove the two cap screws "A" at the front of the track spring adjuster. Turn the adjuster clockwise, as viewed from rear (sprocket end); this pushes the front idler forward, tightening track chain. Turn the adjuster counterclockwise to loosen the track chain.

After the correct adjustment has been obtained, replace the cap screws "A", tighten the lock bolt and replace the cover plate "B".

After the track chain has been thoroughly broken in it is well to check the slack and adjust it if necessary.



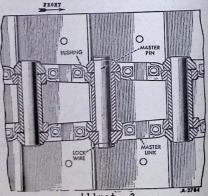
Illust. 2 Adjusting Track Chain.

#### REMOVING THE TRACK

To remove the entire track from the tractor, drive the tractor forward until the track link master pin is in the front of the front idler. The tractor should be level when removing the track chain. Loosen the tension in the track chain by turning the adjuster counterclockwise as described under "TO ADJUST TRACK CHAIN".

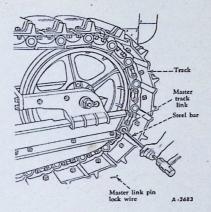
Remove the track link master pin by removing the master pin lock wire and driving out the master pin (See Illust. 4). Run the tractor backward until it is at the end of the track. Place a plank flush against the rear of the track when the track is flat on the ground as shown in Illust. 5. The plank should be approximately the same thickness as the track, narrow enough to fit between the track frame shields, and long enough so the entire tractor can rest of the plank. Now, back the tractor off the tracks and on to the plank.

NOTE: If it is desired to replace the old track with a new one, remove the old track as mentioned previously and place the new track flush against rear of the old track when the track is flat on the ground.



Illust. 3
Track Link Master Pin Assembly.

#### REMOVING THE TRACK - Continued



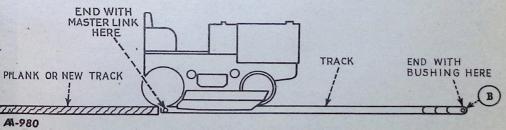
Illust. 4 Master Link Pin Removal

When replacing the track, place the track flush against the plank. The end with the bushing should be in the position shown in Illust. 5. Run the tractor forward on to the track until the sprocket is slightly ahead of the rear end of the track. Put a crowbar through the master pin hole and pull track up around the sprocket and forward over the track idlers and front idlers as the tractor is driven forward.

CAUTION; Drive the tractor forward in low speed with the engine speed control lever in the idle position and ride the brakes so that the tractor does not go too fast. Place a block (about 8 to 10 inches high) under the cleat of the shoe on the last link of the track at "B", Illust. 5, to hold the track against the idler. Engage the engine clutch and apply just enough power in forward speed to take the slack out of the bottom part of the track. Then, replace the master pin and the lockwire. Adjust the tension in the track chain as described on page 1,

#### TRACK ROLLER LUBRICATION

It is important that the track rollers have the proper lubrication. (See "Lubrication Guide" for further information).



### MEMORANDA

# TracTracTor Model TD-18

# REPAIR SECTION

The various assemblies in this tractor are arranged alphabetically, in sections, according to their function.

Each section has a black tab which lines up with the corresponding section name and number shown at the right. The black tabs are quickly located by bending this book back.

The contents of each section can be determined at a glance by referring to the index on the other side of this page.

NOTE: Refer to Section 14, page 1, for important note on tolerances clearances and oil seals.

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ENGINE CLUTCH	4
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FRAME	6
FUEL SYSTEM	7
POWER TAKE-OFF	8
POWER TRAIN	9
STARTING SYSTEM	10
STEERING MECHANISM	11
TRACK	12
TRANSMISSION	13
SERVICE CHARTS	14

# REPAIR SECTION

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#### COOLING SYSTEM

#### Specifications

Control Company Company of the
Type Centrifugal Pump Circulation
Radiator
Thermostats, open at
Thermostats, wide open at
"V" Belt Adjust by moving the idler
Capacity, U.S. Gallons
Water pump capacity, G.P.M
Fan diameter, inches
Fan blades, number
Fan. R.P.M

#### Water Pump

A positive centrifugal pump circulates water in a closed system between the engine block, cylinder head, and radiator. The temperature is controlled by two thermostats of the bypass type which are set in a casting attached to the front of the cylinder head. The path of water circulation when the engine is cool is from the radiator bottom, up through the water pump, through the engine block, up through the cylinder head, and out into the thermostat assembly. Then it flows through the thermostats and is bypassed back into the pump. Any water escaping into the radiator is made up from the supply at the bottom of the radiator. This circulation during the warm-up period prevents the formation of steam pockets.

The thermostats open at 165° F. The temperature controls the amount of opening of the thermostats which in turn controls the amount of water recirculated through the pump and also the amount of cooler water added from the radiator. With the thermostats wide open at 190° F. the bypass is closed and no water is recirculated through the pump. The flow is then from the cylinder

head through the radiator and back to the pump.

The fan assembly and idler pulley run on ball bearings mounted on the sleeve which is a press fit in the water pump body. The impeller is driven through a full-floating-type shaft. The radiator need not be removed to remove the water pump.

Refer to the "Operations Section" for tightening packing, replacing packing, and adjusting fan belt tension.

#### Removal of the Water Pump

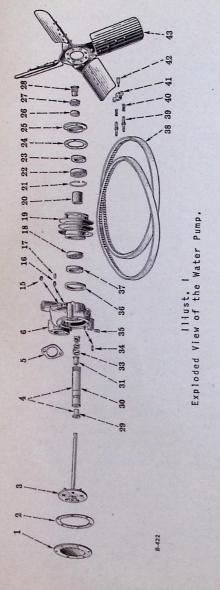
Be sure to drain the water before removing the water pump. Then the off the generator heat shield. After the nut on the pump driver pin (42), Illust. 1, is taken off, the pin can be pushed out. The driver arm and springs at each end then come off. Remove the four cap screws to take the fan blades (45) off. Loosen the generator and push it against the engine block to slacken the belts. Loosen the hose connection clamps and take out the two cap screws and then remove the bottom bolt. With the pump ready to come off, pull it down and lift it out.

INT. 5722B (Repair Section)

# REPAIR SECTION

# COOLING SYSTEM - Continued

# Water Pump



Description	Pump body cover stud. Pump body spacer. Pump felt washer. Oil seal. Fan belt. Pump driver spring. Pump driver. Driver pin. Fan assembly.
Ref.	8 88 88 88 84 4 4 4 4 8 8 8 8 8 8 8 8 8
. Description	Bearing lock 'sleeve. Fan pulley bear- ing clamp nut. Pump packing gland. Pump shaft thrust bushing. Pump shaft sleeve. Pump shaft bush- ing.
Ref.	26 29 29 30 31 35 35
Description	Pump ball bearing. Pump pulley. Pump bearing spacer. Pump bearing re- tainer ring. Pump ball bearing. Oil seal. Bearing retainer gasket. Bearing retainer.
Ref.	22 22 24 25 24 25 25 24 25 25 24 25 25 25 26 27 27 27 27 27 27 27 27 27 27 27 27 27
Description	Pump body cover. Pump body cover. gasket. Pump impeller. Shaft and sleeve assembly. Pump body gasket. Pump body complete. Lubricator. Lubricator with cap.
Ref.	100 00 PULL 100 100 100 100 100 100 100 100 100 1

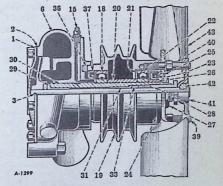
### COOLING SYSTEM - Continued

#### Disassembly of the Water Pump

To remove the pump impeller (3), Illust. 1, take out the stud nuts to remove the pump body cover (1) and the gasket (2). Remove the nut from the tapered driver pin (42) and push it out of the driver (41). Then slide off the driver and the drive spring (40). Unscrew the two pump driving studs (39) and two 3/8" cap screws. The pump impeller (3) can then be slid out the opposite end of the pump.

To disassemble the pulley assembly, unscrew the pump packing gland (28) with a water pump wrench. The pump packing (33) can then be removed from the pump shaft sleeve (4). (At this stage the pump packing could be replaced without proceeding further.) Remove the bearing retainer (25), and the gasket (24). Unscrew the fan pulley bearing clamp nut (27). Then the assembly (18), (19), (20), (21), (22), (23), and (37) can be pulled off the sleeve assembly (4). In doing so, care must be taken to work against the hub and not the flange.

Push the bearing spacer (20) to one side so that the bearing (18) and oil seal (37) can be removed. Then the bearing (22) and the oil seal (23) can be forced out of the pump pulley (19). The snap ring (pump bearing retainer ring) (21) prevents the bearing (22) from moving to the rear. If the snap ring is taken out of the pulley (19), be sure to replace it when reassembling. The pump shaft sleeve (30) can be pushed from the pump body (6). If desired, the pump shaft thrust bushings (23) and (31) may be driven out.



Illust. 2 Cross Section of the Water Pump

1. Pump Body Cover; 2. Pump Body Cover Gasket; 3. Pump Impeller with Shaft; 6. Pump Body; 15. Lubricator Fitting; 18. Rear Ball Bearing; 19. Pump Pulley; 20. Pump Bearing Spacer; 21. Bearing Retainer Ring; 22. Front Ball Bearing; 23. Front Oil Seal; 24. Bearing Retainer Gasket; 25. Bearing Retainer; 26. Bearing Lock Sleeve; 27. Fan Pulley Bearing Clamp Nut; 28. Pump Packing Gland; 29. Pump Shaft Thrust Bushing; 30. Pump Shaft Sleeve; 31. Pump Shaft Bushing; 33. Pump Packing; 36. Pump Felt Washer; 37. Rear Oil Seal; 39. Pump Driving Stud; 40. Pump Drive Spring; 41. Pump Driver; 42. Pump Driver Pin; 43. Fan Assembly.

#### REPAIR SECTION

#### COOLING SYSTEM - Continued

#### Repair of the Water Pump

The bushings (29) and (31) are furnished reamed to size and need only be pressed in place. The impeller shaft diameter is .6225-inch to .6230-inch. The running clearance of the shaft is .0015-inch to .0025-inch.

#### Reassembly of the Water Pump

Press the pump shaft thrust bushings (29) and (31) into their respective ends of the pump shaft sleeve (30). Then press the sleeve into the pump body (6). The felt washer (36) can be saturated with oil and placed in the groove in the pump body.

Locate the retainer ring (21) in its groove in the front end of the pump pulley (19), and press the bearing (22) against it. Pack the inside of the pulley with grease, set the bearing spacer (20) in position, and press the bearing (18) into the pulley hub, snug against the spacer. Then press the oil seal (37) into the pulley (19) against the bearing (18) with the lip of the seal facing the bearing.

Support the pump body below the sleeve (30) and press the pump pulley assembly into the sleeve. Press on the inner race of the bearing only. Slide the bearing lock sleeve (26) over the sleeve (30) and against the bearing (22). Press the oil seal (23) into the bearing retainer (25) so the lip of the seal will not face the bearing (22). Attach the gasket (24) to the retainer (25) and assemble the retainer to the pump pulley (19). Use two opposite cap screws. Turn the bearing clamp nut (27) on the sleeve (30) and tighten.

Slide the impeller (3) into the sleeve (30) and fasten the body cover (1) with the gasket (2) in place. Slide the packing (33) over the front end. of the impeller shaft. Replacement packing is in three segments within the same package. Tap the packing down in

place and run up the packing gland (28). Tighten this gland after the pump is attached to the engine and after it has had an opportunity to run in. Then tighten only sufficiently to stop the pump from leaking. Remove cap screws from the bearing retainer (25).

#### Replacement of the Water Pump

The water pump can be replaced in the reverse order of removal. Be sure all gaskets are new and in place when bolting the pump to the crankcase and head. Assemble the fan belts and attach the generator heat shield. Attach the fan (43) with the regular cap screws (opposite one another) and the two driving studs (39). With springs (40) in place, push on the pump driver (41), and insert the driver pin (42). Attach the nut to the pin.

#### Radiator

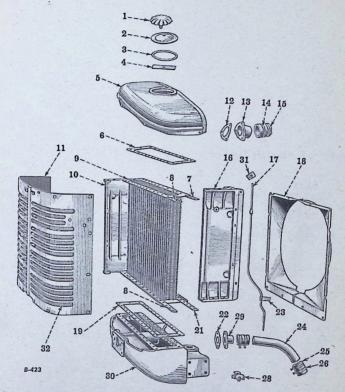
#### Removal of the Radiator

The water must be drained from the system before removing the radiator. Then remove the engine top sheet and disconnect the head lamp at the head lamp junction block. The junction is located on the lower right side of the radiator. Disconnect the water hoses (15) and (25), Illust. 3, at clamps (14) and (26). Close the gasoline shut-off valve under the starting fuel tank attached to the radiator. Disconnect the fuel line from the tank to the carburetor and remove the gasoline tank from the radiator. Remove the radiator guard and then the radiator grille (11) and (32) complete.

Place a rope sling around the radiator and attach it to the lifting unit; or block up the radiator and pull the tractor away from the radiator. If a hoist is used, slide the lower water tank from the ends of the main frame side channels. The tank complete weighs approximately 460 lbs. so be sure the material used will be strong enough to handle the load.

## COOLING SYSTEM - Continued

### Radiator



Illust, 3 Exploded View of the Radiator.

Ref.	Description	Ref.	Description
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	Handle. Cover. Gasket. Clamp. Water tank, upper. Gasket. Core stiffener, upper, rear. Core stiffener, front. Core. Core. Core spacer, right hand. Grille. Elbow gasket. Inlet elbow. Inlet hose clamp. Inlet hose. Core spacer, left hand.	17 18 19 21 22 23 24 25 26 28 29 30 31 32	Overflow pipe.  [Sheet, left hand.]  [Sheet, right hand.]  [Gasket.]  Core stiffener, lower, rear.  Outlet elbow gasket.  Pipe clip.  Outlet pipe.  Outlet hose.  Outlet hose clamp.  Drain cock.  Outlet flange.  Water tank, lower.  Overflow pipe gasket.  Grille screen.

#### REPAIR SECTION

#### COOLING SYSTEM - Continued

#### Dissassembly of the Radiator

Remove the sheet (18), Illust. 3, from the rear side of the radiator assembly. The upper water tank (5) can be removed by taking out cap screws in the core spacers (10) and (16) and also by removing the cap screws from the core stiffeners (7) and (8).

The lower water tank (30) can be removed the same way. The outlet flange (29) is held to the lower water tank by two cap screws.

The core (9) can be reassembled to the water tanks by reversing the above procedure. The overflow pipe (17) is attached with a fitting to the upper water tank (5).

#### Reassembly of the Radiator

Reassembly of the radiator is the reverse of disassembly.

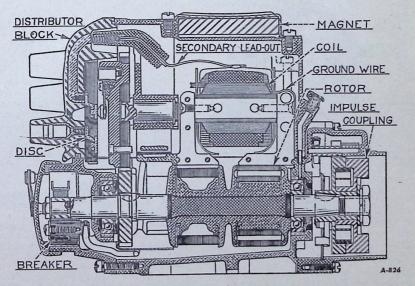
#### Replacement of the Radiator

Replacement of the radiator on the tractor is the reverse of the removal from the tractor. Where front power take-off is used, refer to that heading in Section 8.

#### ELECTRICAL SYSTEM

# Ignition System

Magneto Model						International Harvester F-6
Rotation	•					Clockwise
Magneto Grounding Switch						Automatic in Manifold
Breaker Point Gap			•			.020-inch
Spark Advance	•			•		15°
Impulse Coupling Advance						T. D. C.
Magneto Gear, Helical						36 Teeth
Magneto Gear Idler						27 Teeth
Drive						Camshaft
Spark Plug Size	•	•				7/8-inch-18, 15/16-inch Hex.
Spark Plug Gap	•					.035 to .040-inch
Firing Order				•		1, 5, 3, 6, 2, 4



Illust. I Cross Sectional View of International F-6 Magneto.

#### Magneto

Distributor Disc

A-1215

The I.H.C. F-6 magneto is of the fixed spark type, incorporating an impulse coupling on the drive end to retard the spark during the starting procedure. The breaker and distributor mechanisms are located at the rear. The coil and condenser are completely enclosed and located below the horseshoetype magnet.

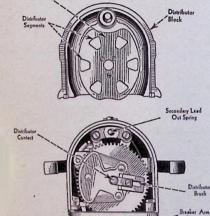
The timing of the magneto to the engine is covered in the "Operations Section".

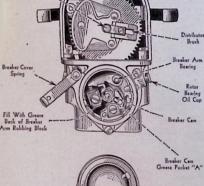
Service information starts with the breaker mechanism, followed by the distributor, safety gap, coil, condenser, impulse coupling, and finally the rotor. The arrangement is in line with trouble-shooting technique.

## Magneto Circuit Breaker

#### Preliminary Examination

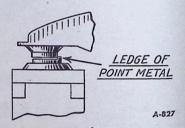
Remove the breaker housing cover, Illust. 2, and examine for correct point performance and setting. A ledge of point metal running up to the side of the companion point, Illust. 3, causes a slow break and poor performance.





Illust. 2
Detail of Magneto Distributor
and Breaker Mechanism.

eaker Housin

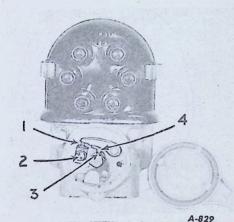


Illust. 3 Ledge of Point Metal Causes a Slow Break and Poor Performance.

Breaker points on the magneto should be set to .020-inch. To adjust the point opening, slightly loosen the stationary point support screw (2), Illust. 4, and use a screw driver as a pry to move the stationary point support. Tighten the screw and check the adjustment.

A-828

#### ELECTRICAL SYSTEM - Continued

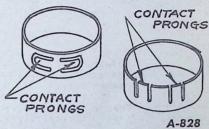


Illust. 4 Breaker Adjustment.

1. Breaker Point Opening; 2. Stationary Point Support Screw; 3. Breaker Cam; 4. Breaker Arm Rubbing Block on High Ridge of Cam.

#### Preliminary Examination -Continued

Examine the breaker for excess oil around the outside and at the bottom. Occasionally, over-oiling may be noticed. This may interfere with the proper primary circuit from the cup member to the breaker housing. The contact prongs of the breaker cup, Illust. 5, are bent out at the factory to make a firm electrical circuit between this cup and the housing in which it fits. Oil interferes with this contact. Likewise, a loose fitting cup produces the same effect. BEND THE PRONGS OUT, if necessary, and reduce the oil supply.

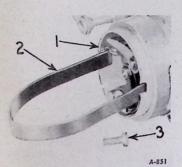


Illust. 5 Contact Prongs on the Breaker Cup Should be Bent to Make a Firm Electrical Circuit.

# Circuit Breaker Cup Removal

A simple tool for removing the circuit breaker cup may be made from a discarded flat impulse coupling spring.

Bend the spring into a "U" shape and turn a short lip at a right angle on both legs of the "U". These two lips should be long enough to hook in back of the bent over lips on the breaker cup slots which are used to move the cup to advance or retard the spark.



How Tool is Used to Remove Breaker Cup.

Breaker Cup; 2. Spring Tool; 3.
 Primary Lead-out Terminal Screw.

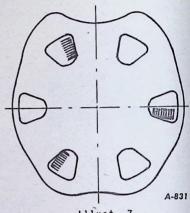
#### Circuit Breaker Cup Removal -Continued

To remove the breaker cup, first remove the primary lead-out terminal screw (3), Illust. 6. A light blow on the head of this screw after it has been loosened about two turns will free the lead-out terminal and facilitate the breaker cup removal. The breaker cup must be positioned so that the slot in the rear of the cup registers with the pin which is a stop for the advance and retard action. A light pull on the puller, as shown in Illust. 6, will then remove the breaker cup.

# Magneto Distributor

#### Examination

Remove the distributor block, Illusts. 1 and 2. Examine the brush track for black carbon, burns, and for the spot on the bronze insert that tells whether the spark has been occurring at the correct



Illust. 7 Correct Timing Spot Mark on the Distributor Disc.

place. A magneto spark is a rather long drawn-out discharge. It has a tendency to burn the brush track unless the spark is started soon enough to permit a rather complete discharge before the brush runs off the insert and onto the distributor disc surface. The distributor disc brush track can be readily cleaned of black carbon with a soft rubber eraser. Do not use sandpaper.

The sparks of the magneto are of alternate polarity and, therefore, spots each alternate distributor disc insert the same.

Those who are familiar with direct current arc welding readily realize that the direction of current flow has an important bearing on the heat generated when an arc is created in the circuit.

The spark spots should always come on the leading edge of the inserts as shown in *Illust*. 7, otherwise the distributor disc will burn as the brush leaves at the other side.

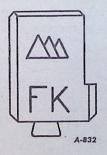
#### Examination - Continued

The disc should be almost completely free of smeared carbon on the brush track, although it may show considerable scratching. This scratching is especially characteristic of the brush stamped (X) on the side. This does not matter so long as the brush track is clean and the disc wear is not excessive.

#### Distributor Disc

The distributor disc and brushes, Illust. 2, should be examined periodically and the disc should be kept clean. The disc can be cleaned with a soft rubber eraser which is free of grit and abrasives and will not scratch disc surface. If the disc becomes badly worn it may be replaced by removing three bakelite screws that hold the disc to the distributor block. When replacing the bakelite pins or screws, the heads should be given a light coat of shellac. This will help prevent them from loosening, and seals them against the possibility of changing shape from the effects of moisture.

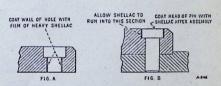
When the brushes and the disc are properly related, the brush track will wear very slowly; it will be polished and reasonably smooth. If other than this condition exists, check the gaskets for entrance of moisture or dirt. Be sure the proper brushes are used.



Illust. 8
Identification
Markings on
National Carbon
Brush Used in
the Magneto.

If the magneto has been operating with the proper spark advance in relation to the distributor gear setting, a slightly blackened condition ("spark spot") will exist on the insert at the leading end of the brush contact. If the magneto has been operating with the spark not properly advanced, this blackened spot will be at the center of the insert. The longest life of the distributor disc can only be secured by the proper timing and the exclusion of all water.

When replacing a distributor disc, the distributor disc pin should first be pushed into place in the disc before final assembly to the gear. Check the clearance between the body diameter of the pin and the hole in the disc. If excessive clearance exists, the disc may eventually come loose after assembly and cause excessive disc and brush wear which may result in faulty performance of the magneto.



Illust. 9
Installing New Distributor
Disc Pin.

To correct such cases where excessive clearance exists, the following procedure should be used. Coat the hole in the disc with a film of heavy shellac as shown in sketch Figure "A", Illust. 9. Allow the shellac to dry thoroughly. Place the disc on the gear. Coat the pin with shellac and drive it into place through the disc and into the gear. Be careful not to strike the disc because it may crack readily. Then coat the head of the pin with shellac, allowing same to run into the space between the head and the counterbore in the disc (see

#### REPAIR SECTION

#### ELECTRICAL SYSTEM - Continued

#### Distributor Disc - Continued

sketch Figure "B", Illust. 9). Wipe off excessive shellac from the face of the disc. Be absolutely certain that no shellac remains in the brush path. This procedure, if carefully followed, will give an assembly which will remain tight indefinitely.

#### Distributor Brushes

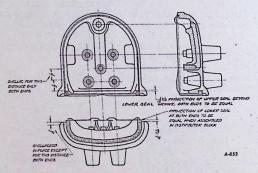
These brushes have to be of the proper material to match the disc they are rubbing against. This material has been worked out for each magneto by test. The brush is the new National Carbon grade, lettered "FK" on the side. (See Illust. 8). These brushes run rel-

atively clean and are less aggressive than earlier brushes.

#### Distributor Block Gaskets

For satisfactory performance of a magneto, water should not be permitted to find its way inside. Magnetos are fitted with distributor block gaskets of waterproof construction. This is being done in two ways, one by waterproofing the felt, and the other by applying a narrow lamination of artificial rubber in the gasket to prevent seepage from working through.

In wet localities, see that these gaskets are used in case ignition troubles are experienced. Assemble them as shown in *Illust*. 10.



Proper Method of Assembling Distributor Block Gaskets.

Keep the outside of the distributor block clean of mud and water. Some soils produce a mud that is a very good conductor of electricity. With the exterior surfaces of the distributor block coated with such material, the electrical losses may readily reach values that jeopardize ignition, especially when starting is attempted.

#### Safety Gap

If the breaker and distributor of

the magneto are both found to be in good condition, carry the examination further. Leave the distributor block off, advance the spark, disengage the impulse coupling, Illust. 22. Then turn the magneto briskly by hand. A spark should jump regularly across the safety gap. This test cannot be made on the F-6 magneto unless the safety gap is reduced from the regular setting of 7/16-inch to 15/32-inch to the test dimension of 9/32-inch to 11/32-inch.

#### Safety Gap - Continued

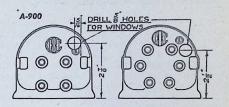
If the spark is still unsatisfactory, intermittent, and weak, the examination must proceed still further. Remove the magnet and frame cover. Check the condenser; put in a new one, if it is available, and test the magneto for spark once more. Also test the condenser as explained under that heading.

The frame cover may be left off for this test; however, it is necessary to replace the magnet on the magneto. The spark should jump the safety gap with the breaker in the advance position with the rotor being turned briskly by hand. If performance is satisfactory, the condenser was at fault. Reset the magneto safety gap to 7/16-inch to 15/32-inch.

Assuming that the condenser exchange did not correct faulty operation, it will be in order to check the primary lead-out wire for open circuit and for grounding. This is done by using the 6-volt line on an electrical test set. Disconnect the primary lead-out wire terminal from the condenser and turn the rotor until the breaker points are open. If the primary lead-out wire shows a closed circuit from the terminal to the screw in the spring anchor, and an open circuit from either terminal to any grounded surface, then the fault lies either in the coil winding or in the coil installation.

High humidity, extreme high temperatures, or high altitudes, or a combination of all three, may cause internal jumping of the spark. If a magneto starts jumping the safety gap, determine the cause and correct it. These gaps are amply long for almost every condition where internal combustion engines are operated, except high altitudes.

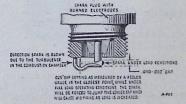
A spark jumping a safety gap can be readily detected by replacing the regular distributor block on the magneto with one in which a transparent window has been provided (Illust. 11). Run the engine



Hole for Window in Distributor Block for Observing Spark Across Safety Gap.

for a sufficient time to permit the air in the magneto to attain the normal operating temperature, and observe through the window if the spark is jumping the safety gap. If it is, check all spark plug gap settings. It may be necessary to file off the spongy metal at the tips of the spark plug wires and close the gap to .020-inch. If the spark still jumps the safety gap, with the engine running, the safety gap may be increased. Cut off and re-form the spark plug lead-out closer to the secondary lead. (See "G", Illust. 13.)

A window, rather than just an opening, must be used; otherwise air conditions in the magneto will change and probably prevent the spark from jumping. Drill holes in the block as shown in Illust. 11; then, with a drill slightly larger in diameter, counterbore the same hole. The window can be made of celluloid to fit the counterbore hole and then cemented in place with shellac.



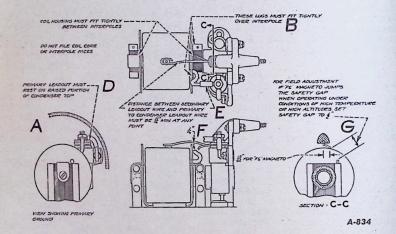
Difference Between Actual and
Measured Spark Gap,

#### Safety Gap - Continued

Spark plug electrode wires burn off on one side more than the other because the spark is blown there. Keep the spark plug gap set close (.035-inch to .040-inch). In many cases, even then the spark is jumping .040-inch to .060-inch due to turbulence in the combustion chamber, Illust. 12.

If the spark still jumps to the frame cover after re-forming the safety gap three coats of insulat-

ing varnish may be applied to the inside of the frame cover, allowing sufficient time for drying between each coat. A spaghetti insulator can be slipped over the high tension lead-out, or it may be coated with insulating varnish with the exception of the contact point. Another method is to place a thin sheet of bakelite under the roof of the frame cover. Varnish coating is suggested as an extreme emergency measure for very high altitudes, and should not be done unless absolutely necessary.



Illust, 13
Drawing of Magneto Coil Assembled in Place on the Magneto with Servicing Pointers for Installing Coil Properly,

# Magneto Coil

#### Examination of the Ground Connection

Examine the ground connection of the winding to the interpole, "A", Illust. 13. This wire should be securely tightened to the countersunk hole in the interpole. The coil housing should be a tight press fit between the interpoles endwise, so that it cannot shift and wear loose from engine vibration. If this happens, the ground connection, or the wire to the condenser, will crack in two. A very slight amount of motion will bring this about. Now see that this fault does not exist in the magneto being examined.

#### Examination of the Ground Connection - Continued

Assuming the spark is still unsatisfactory, it will then be necessary to replace the coil. It must be faulty because everything else has been gradually eliminated as the source of trouble. However, an additional check for faulty coil can be made before removing the coil from magneto.

As a final check for a faulty coil, the coil may be tested while still on the magneto by using an electrical test set. Turn the magneto rotor until breaker points are separated, and remove the primary wire terminal from condenser post. Snap the winding test lead clip on the terminal primary wire to the condenser and the other test lead clip on any grounded part of the magneto. Hold the high tension test point on the secondary lead-out wire. Interrupted primary current should cause the spark to jump the 5/16-inch test gap on the testing set.

In this case, the method of testing the coil while it is still on the magneto is listed for the information it will give. The coil on the test magneto has already been proved faulty by previous checks. The coil should now be removed from the magneto and replaced with a new one.



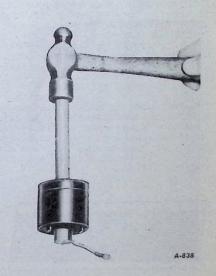
Illust, 14 Coil Removed from Magneto.

Distributor gear and Bearing;
 Coil Core Screw;
 Coil Ground Wire;
 Interpole.

#### Removal of the Coil

Disconnect the condenser "D", Illust. 13. Then remove the distributor gear and bearing (1), Illust. 14. Next, remove the coil core screws. Remove the coil ground wire from the interpole. Force the coil upward slowly with the aid of a screw driver.

The core should always be in position in the center of the windings when testing the coil on the electrical testing instrument. If the core is not in place, the transformer set-up of the coil is not complete and no spark will appear at the gap. This test should not be prolonged any more than is necessary to obtain the check. Subjecting the coil to the test conditions for a prolonged period may damage it.



Illust. 15
Removing Coil Core with Hard
Wood or Fiber Punch.

#### Disassembly of the Coil

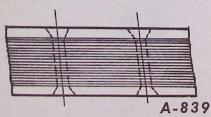
Remove the coil core from the defective winding. Hold the coil in one hand, preferably with the coil lid up. By the use of a flat-end hardwood or fiber punch, at least 5/8-inch to 11/16-inch in diameter, drive the core downward between the fingers, Illust. 15. Be sure to hold the coil firmly when driving out the core. The bakelite coil case is brittle and will break if dropped. Never use a metal punch of any kind.

#### Coil Core Fit Between Interpoles

The least defect on the joining surfaces between the coil core and interpole will permanently impair the magneto's operation.

This joint must be a clean "sucking" fit, similar to the fit when two Johannsen gauge blocks are put together. They stick by virtue of their flatness after being properly "wrung" together. No rust, no oil, or foreign matter of any kind must be on these surfaces. Do not try to correct defects by filing the ends of the coil core. This can only end in failure.

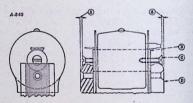
The coil core is made of laminated electrical sheet steel. It is held together by two rivets. If struck vigorously with a metal tool, it will burr and may be knocked out of line as shown in exaggerated form in Illust. 16.



Illust, 16 Drawing Shows Coil Core Knocked Out of Square.

The coil must be a tight fit between the interpoles and on the coil core. Otherwise vibration will loosen it and cause failure.

Do not attempt to file the diameter of the coil core so that it will slip into the winding easily, file the ends to make it fit tween the interpoles easier. Paint the coil hole generously all around with a thick asphalt solution for a 3/8-inch length at each end before pressing in the core. The core should be a hard press fit in the winding and it may have to clear a path by removing a small amount of varnish as it is pressed in; this is permissible and will cause no damage, provided it is started and pressed in straight. Clean the core ends thoroughly of paint. These surfaces must be absolutely clean. The coil should be a hand press fit between the interpoles. The bakelite housing will normally be a little longer than the coil core and should not be filad



Illust. 17
Testing Coil Core Screws Before
Assembling Coil and
Core to Magneto.

A. 1/32" Minimum; B. Coil Core; C. Coil Core Mounting Screw; D. Interpole.

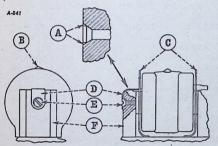
The guide lugs on the coil housing should fit the interpole so that they bear against it lightly, just enough to keep the winding from moving sideways or turning around on the screws. A check should be made on the length of the coil core screws. They should be bottomed

#### Coil Core Fit Between Interpoles - Continued

lightly in the core and the winding placed on top of the interpoles with the screws in place (Sec Illust. 17). In this position it can be readily seen whether the screws bottom before they tighten or not. If the guide lugs are too tight on the interpole, they may be filed until they fit properly. Be careful not to touch the end of the core with the file during this operation.

If either screw head does not fall back of the face of pole piece by 1/32-inch minimum shown, it must be removed and enough cut off the end to meet this requirement. This is done so that when the coil core is in place, the screws will tighten up in the pole piece countersink before the screws bottom in the coil core.

Caution: Do not file or in any way deface the ends of the coil core or the face of pole pieces as this will impair the magnetic circuit and efficiency of the magneto. The coil core should be a light press fit between the pole pieces.



Illust. 18 Method of Grounding Coil.

A. If Countersunk Hole in Pole Piece Has a Shoulder, Remove it Before Assembling Coil Grounding Stripunder Coil Mounting Screw, Otherwise Coil Grounding Strip Will Not Make a Good Contact; B. High Tension Terminal; C. Coil Insulators; D. Coil Grounding Strip; E. Screw; F. Coupling End of Pole Piece.

#### Assembly of the Coil

Locate the coil and core in the magneto so that high tension terminal "B", Illust. 18, is on a vertical center line as shown.

Assemble the coil grounding strip "D" under the coil mounting screw "E" in the pole piece "F"as showm. Tighten the screw firmly. The surface of the countersink in the pole piece and grounding strip must be clean and bright before assembling.

If there is a shoulder in the countersink hole in the pole piece, the shoulder must be removed.

#### The High Tension Lead-Out

Do not allow this lead-out to touch the bakelite coil housing at any point. Maintain 1/16-inch between the secondary lead-out and the coil housing, "F", Illust. 13. This is to prevent a drop of moisture from bridging at this place. If this wire is raised too high, the spark will jump upward to the roof of the aluminum cover.

# -Magneto Condenser

#### Examination

All metal surfaces contacting the condenser should be thoroughly cleaned to insure a good ground. See that the condenser is pushed down as far as it will go before tightening the clamp. Refer to "E" and "D", Illust. 13, for instructions on the proper positioning of the lead wires to the condenser terminal screw. It is very important that these wires be positioned as shown in the illustration to prevent "shorting" or "grounding". The condenser furnished for replacement does not include the condenser nut (10-32) which must be obtained separately.

#### Testing Condenser

A sensitive Neon tube type condenser tester is recommended. This type of tester will conclusively show up defects in the condenser

#### REPAIR SECTION

#### ELECTRICAL SYSTEM - Continued

#### Testing Condenser - Continued

that cannot be indicated with ordinary test equipment. Such Neon condenser testers operate on 110volt A.C. current. A special switch on the box allows for testing at four different voltages, ranging from 100 to 600 volts. To determine the exact condition of any condenser, use only the 100 and 200-volt test settings. The use of the 400 and 600-volt test set-tings will in no way injure the condenser being tested; neither will the readings of the test be as accurate as when using the two lower voltage settings.

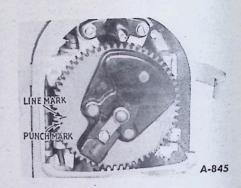
Hold one test point on the condenser terminal and the other on the outer metal housing of the condenser. If infrequent flashes occur in the Neon tube with the switch set on the 200-volt position and the tube flashes only for initial charge with the switch set on the 100-volt position, the condenser will pass satisfactorily. If the condenser gives continuous flashes at 200 volts, it should be discarded even though it tests satisfactorily at 100 volts.

#### Primary Lead-Out

The primary lead-out fastening and positioning on the condenser end has been described. This wire carries the primary current from the winding to the breaker. It is made of carefully insulated stranded copper wire chosen for its long fatigue life when flexed repeatedly. It is long enough so that the circuit breaker may be removed and examined without disconnecting at the breaker end. When the breaker is replaced, this extra length of wire should be tucked under the primary lead-out shield 21331 D in the magneto frame.

#### Timing the Distributor Gears

This Diesel engine has the magneto timed for 15° spark advance. The spark is fixed by an external link on the breaker cover. Use the line mark for timing distributor gears.



Illust. 19 Line Mark Used for Timing Magneto of 15° Spark Range.

# Designating Marks and Special Features

This magneto has the letter "D" stamped on the frame preceding the serial number. Magnet and impulse coupling housing are both painted white. The magneto is fitted with a timing link that provides 15° spark advance measured on the engine crankshaft. It is timed by using the line mark on the distributor gear. It is also fitted with a special main pawl in the impulse coupling and special engaging pawls. These are designed to lower the "throw-out" speed of the coupling and thus insure easier starting.

#### Distributor Shaft and Bearing

After the distributor gear is properly meshed with the rotor pinion as indicated in Illust. 19, see that the teeth have a very slight amount of clearance so that no radial pressure is exerted on the distributor shaft bearing. Use shims under the bearing bracket, if necessary, to provide this clearance.

# Distributor Shaft and Bearing - Continued

The distributor shaft end play should not be more than .014-inch or less than .003-inch; preferably .003-inch. The reason for this is that excess end play at this point allows the distributor disc to travel back and forth, causing more or less uneven brush pressure and creating excessive wear on the disc brush track. This end play may be adjusted by placing special shim washers Number 12588 C which are .004-inch thick and Number 12589 C which are .008-inch thick, between the retainer spring and the rear thrust washer.

The bushing in the distributor bearing is porous bronze which permits oil to filter through from the oil passage. The passage is supplied with oil from the cup on top of the magneto cover.

# Charging the Magnet

Always recharge the magnet during an overhaul.

Magnetizer terminals are usually identified + and -, and must be so connected to a well-charged 6-volt storage battery. The magnet should be inserted into spools from the side indicated with the IHC trademark on the magnet on the right. The magnet will then be magnetized in accordance with original factory polarity. If the magnet has no IHC trade-mark, hold it in front of the spools and depress the switch an instant. The magnet is being inserted properly if the magnetizer tends to pull it into the spools.

Push the magnet all the way into the spools and place a keeper over

the ends. Compress the magnetizer switch once or twice for about two seconds. To keep the switch depressed longer, accomplishes no further good, but discharges the battery unnecessarily and heats up the magnetizer.

Slide the keeper downward off the ends of the magnet, pull the magnet from the spools and immediately assemble on the magneto. Never slide the keeper up on the side of the magnet, as this will result in partial demagnetization.

#### Impulse Coupling

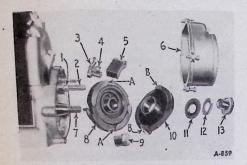
A magneto is capable of delivering suitable sparks at higher speeds; but for slower speeds and for starting, it is necessary to drive the rotor or armature through an impulse coupling. This impulse coupling permits the production of a strong magneto spark at the slowest cranking speeds. The impulse coupling on this magneto is completely automatic and requires no adjustment or manual engaging or disengaging. An occasional cleaning and generous lubrication with light oil is the secret of satisfactory impulse coupling performance.

#### Operation

The impulse coupling operates as follows: The cam member (10), Illust. 20, is locked to the magneto drive shaft on the engine and always rotates steadily at a definite ratio to the engine speed. The magneto member (8), with drive spring and engaging pawls, is keyed to the magneto rotor shaft driving end (7). The cam member and magneto member are connected by a spiral drive spring, shown in magneto member (8).

#### REPAIR SECTION

# **ELECTRICAL SYSTEM - Continued**

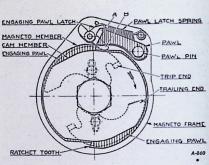


Illust, 20
Exploded View of F-6 Type
Impulse Coupling.

I, Pawl Spacer; 2. Pawl Pin; 3. Pawl Latch Spring; 4. Engaging Pawl; 5. Pawl; 6. Coupling Cover; 7. Magneto Rotor Shaft; 8. Magneto Pawls with Engaging Pawls and Spring; 9. Impulse Coupling Puller, SE-912; 10. Cam Member; 11. Washer; 12. Lock; 13. Coupling Nut.

#### Operation - Continued

As the cam member and magneto member rotate slowly, a pawl (5), which pivots on a pawl pin (2) mounted to the magneto frame, engages in the upper ratchet slowly in the magneto member and prevents the magneto member from turning. The cam member continues to turn and winds up the drive spring for approximately 46°. The pawl is then tripped from the ratchet slot by cam member (1). The spiral drive spring unwinds, hurling the magneto member unit and rotor rapidly forward until the end of milled slots (A) in the magneto member strike lugs (B) on the cam member. The complete coupling will then rotate at the same speed, as a unit, until the pawl catches on the following ratchet slot. There are four equally spaced ratchet slots in the magneto member of the magneto coupling. Tripping of the pawls is timed to cause a spark to occur between top dead center position to 8° after dead center, provided the magneto is timed cor-



Illust. 21 End View Drawing of Impulse Coupling.

rectly to the engine.

The impulse coupling is designed to automatically throw out at 130 to 200 R.P.M. As the speed of the impulse coupling increases, the cam member disengages the pawl from the ratchet teeth with greater force. When the throw-out speed is reached, the pawl is thrown high enough to catch the latch tip under the pawl ledge "A", Illust. 21. In this position, the pawl is supported out of engagement and the coupling rotates as a single unit, turning the magneto rotor at a steady speed with the engine. When the impulse coupling speed is reduced to between 125 to 145 R.P.M., the coupling automatically . comes into operation again. As throw-in speed is reached, As trailing ends of the engaging pawls, which are the heavier, drop down on the magneto member hub when passing over the center of rotation. By so doing, the trip ends raise to a position where they will strike the lower arm of the engaging pawl latch "B", releasing the



Illust. 22
Shows How Main
Pawl Can be
Lifted,
Disengaging the
Impulse
Coupling for
Free Rotation
During Timing.



Illust. 23
Shows How Latch
Is Tripped,
Allowing Pawl
to Drop in
Operating
Position.

#### Operation - Continued

latch from the pawl. The pawl then drops into working position and the impulse coupling is again in operation.

#### Release of Impulse Coupling

By manipulating a light finishing nail through the oil cup as shown in *Illusts*. 22 and 23, the pawl may be lifted for free rotation during timing.

By placing the nail in the position shown in *Illust. 22*, and prying downward on the outer end, the pawl may be lifted and the latch will hold it up. It may be necessary to turn the rotor (or rotate the magneto) to a point just past the trip of the impulse to accomplish the lifting of the pawl. If the pawl is in the low position, and the impulse spring is partly wound up, it will be impossible to move it with the nail.

To return the pawl to the operating position, place the nail in the position as shown in *Illust*. 23, and press down on the outer end of the nail to lift the latch.

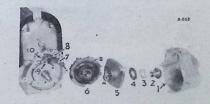
#### Removal of the Impulse Coupling

To remove the coupling member (6), Illust. 24, start puller (9), Illust. 20, in the threads. Then lock the member (6) with the pawl (7), Illust. 24, and screw the puller in until considerable effort is required to turn it. If the impulse has been allowed to stand or operate without sufficient oil, the

coupling member (6) is likely to be rusted and stuck on the shaft. It may be necessary to use two screw drivers, one from each side, between the coupling and the magneto frame, and to hit the puller (9), Illust. 20, a rather hard blow while at the same time exerting pressure on the screw drivers. Care must be used when this condition exists to remove the member without damaging the threads or the magneto frame.

# Disassembly of the Impulse Coupling

To separate the cam member from the magneto member, pull outward until the lugs clear, let it unwind about one-half turn, and then remove. The drive spring can be easily pried out with a screw driver. In replacing the spring, first hook it into position at "B", Illust. 24 being sure it will wind in the direction shown. Wind the spring into position, using the right hand to push it gradually down and the left hand to hold the wound coils in place.



Illust. 24' Impulse Coupling Dismantled from the Magneto.

#### Reassembly of the Impulse Coupling

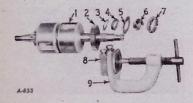
When assembling the coupling be sure that the hub of magneto member (6), is clean and well oiled. If the latch spring (8) is rusty, replace it with a new one. Couplings must be oiled generously with light oil at regular intervals. When the weather is extremely cold, kerosene should be used.

Snap rings hold the engaging pawls to the pawl pins. They must be tight on the pawl pins when in place, otherwise they will wear and fall off. This causes general damage of the magneto frame.

#### Magneto Rotor

#### Removal of the Magneto Rotor

To remove the rotor, first remove the impulse coupling. Use puller (9), Illust. 20, to avoid injury to the rear of the magneto frame. Then take off the distributor block, magnet, magneto frame cover, distributor disc, bearing assembly, and breaker housing cover. Remove the primary lead-out terminal screw and three breaker housing screws. The breaker housing and then be removed from the magneto frame and the rotor taken from the frame.



Illust, 25 Exploded View of Rotor Parts with Inner Race Puller Tool, SE-839.

I. Rotor; 2. Rotor Pinion; 3. Rotor Shims; 4. Rotor Shaft Bearing Spacer; 5. Oil Flinger; 6. Inner Bearing Race; 7. Ball Bearings and Separator Assembly; 8. Bearing Race Adapter; 9. Puller. The inner bearing race can be readily removed from the rotor by using puller and adapter, (8) and (9), Illust. 25. It is necessary to remove the inner bearing race when removing or inserting rotor shims for preloading rotor bearings. Refer to the "Preloading Rotor Bearings" heading.

#### Removing and Replacing the Magneto Outer Bearing Race

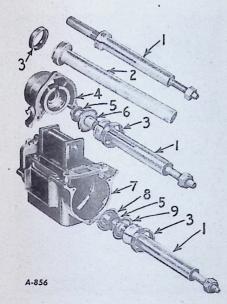
The magneto outer bearing race in both the breaker housing and magneto frame can be readily removed with tool (1), Illust. 26. Loosen the expander and insert the tool into the bearing race in the direction shown. Manipulate the splitsleeve flange through the bearing race and hold it against the felt retainer. Now draw up on the expander by applying a wrench to the flats on the threaded end of the expander and turning in an anticlockwise direction until a definite pressure is felt. Then tighten the hexagon nut, and carefully drive the bearing race from place.

Before replacing the outer bearing races, make sure the felts and retainers are correctly assembled in place. Set the bearing race on the end of a tool such as (2). A small amount of clean grease will hold the race on the tool. Carefully line up the tool over the hole and drive the race into place.

#### Preloading Rotor Bearings

In order to maintain the high efficiency of this magneto, it is necessary to reduce the air gaps in the magnetic circuit to a minimum. To do this, the rotor clearance is held close. A small amount of end play would allow the rotor to rub, due to the construction of the ball bearings. They are made to take lateral as well as radial load.

To avoid any possibility of the bearings becoming loose, they are preloaded from .000-inch to .002-inch lengthwise. To do this, assemble the rotor with just enough



Tools Used for Removing and Replacing Magneto Outer Bearing Races.

I. Magneto Bearing Race Puller Tool, SE-1020; 2. Magneto Bearing Race Replacer Tool, SE-1021; 3. Outer Bearing Race; 4. Breaker Housing; 5. Felt; 6. Felt Retainer, Breaker Housing End; 7. Frame; 8. Felt Retainer, louter; 9. Felt Retainer, louter; 9. Felt Retainer, louter; 9. Felt Retainer, louter; 9.

#### Preloading Rotor Bearings -Continued

shims to set the end play at nothing, or a point where no perceptible play can be felt and still be free. This is to be tried with the rotor in the frame, the bearing housing in place, and all the screws tight. The bearings should be free of grease and oil to get an accurate fit. Then remove the bearing housing, bearing inner race

and flinger, and add one .002-inch or .0025-inch shim. (See Illust. 25.) The washer shims should be between the inner race and the gear on the rotor shaft. After this setup is completed, be sure that the shaft does not bind and that the preloading was all done with the last placed shim of .002-inch or .0025-inch. Too much preloading will ruin the bearing. Some relief to these bearings is provided as soon as the magneto starts to warm up on the engine. The aluminum frame expands more rapidly than the steel rotor shaft and thus relieves the preloading to a large degree.

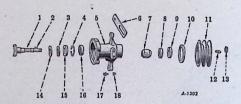
# Fan Idler Pulley

To remove the fan idler pulley, take out the two bolts in the idler bracket (5), Illust. 27.

#### Disassembly of the Fan Idler Pulley

To disassemble the idler, unscrew nut (13) and pull the idler pulley (11) from the fan belt idler shaft (1). Be careful to work on the hub of the idler pulley (11) and not on the flange.

Then replace nut (13) on the shaft and drive it in carefully until the key (2) turns out of the shaft sufficiently to remove it. Remove nut (13) and pull out the fan belt idler shaft (1) from the opposite end. Remove the idler shaft felt (3) and the felt retainer (14). Also remove the idler oil seal (15). Take out the idler bearing lock ring (4) (be sure to replace this when reassembling). The inner bearing (16) is driven out by driving against the inner race of idler bearing (8) until this bearing can be lifted out. Then remove the idler bearing spacer (7). Drive the idler bearing (8) out the opposite direction from where the shaft was removed. The idler oil seal (9) comes out with the bearing (8).



Illust. 27
Exploded View of the Fan Idler Pulley.

I. Idler Shaft; 2. Pulley Key; 3. Shaft Felt; 4. Lock Ring; 5. Idler Bracket; 6. Pulley Brace; 7. Bearing Spacer; 8. Bearing; 9. Oil Seal; 10. Pulley Felt; 11. Idler Pulley; 12. Lock Washer; 13. Nut; 14. Felt Retainer; 15. Oil Seal; 16. Bearing; 17. Lubricator; 18. Plug.

#### Reassembly of the Fan Idler Pulley

Reassembly of the fan idler pulley

is the reverse of the disassembly procedure. Tips of the oil seals (9) and (15) face.

## Generator and Relay

# Generator Specifications

Rotation -- clockwise, viewing drive end.
Brush spring tension -- 14 to 18 ounces.

Maximum cold output -- 8 to 10 amperes at 14.4 to 14.9 volts at 2200 R.P.M.

Maximum hot output -- 6 to 8 amperes at 14.1 to 14.5 volts at 2400 R.P.M.

Field current (third brush lifted) -- 1.50 to 1.67 amperes at 12 volts.

# Generator and Relay

The Delco-Remy Model 1101724 Generator is a 12-volt, third brush unit with a ball bearing in the drive end and a bronze bushing in the commutator end. A Model 1116810 Cut-Out Relay is mounted on the generator frame.

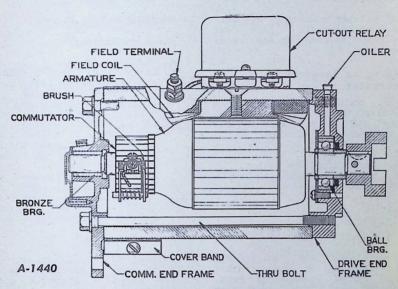
#### Maintenance of the Generator

General maintenance may be divid-

ed into two sections, normal maintenance required to assure continued operation of the generator and the checking and repair of inoperative generator.

#### Normal Maintenance of the Generator

Lubrication: The two hinge cap oilers should be supplied with 8 to 10 drops of light engine oil every 60 hours of operation. Do



Illust. 28 Cross Section of Generator.

# Normal Maintenance of the Generator - Continued

not oil excessively. Never oil the commutator.

Inspection: The cover band should be removed and the commutator and brushes inspected at regular intervals. If the commutator is dirty, it may be cleaned with No. 00 sandpaper. Blow out dust.

NEVER USE EMERY CLOTH TO CLEAN COMMUTATOR. If the commutator is rough, out of round, or has high mica, it should be turned down in a lathe and the mica undercut.

Worn brushes should be replaced. They can be seated with a brush seating stone. The brush seating stone is an abrasive material which, held against the revolving commutator, carries under and

seats the brushes in a few seconds. Blow out the dust. NEVER USE EMERY CLOTE.

#### Disassembly of the Generator

At regular intervals, the actual mileage or time depending on the type of operation, the generator should be disassembled for a thorough cleaning and inspection of all parts. Never clean the armature or fields in any degreasing tank, or with grease dissolving materials, since these may damage the insulation. The ball bearing should be cleaned and repacked with a good grade of ball bearing grease. The commutator should be trued in a lathe and the mica undercut if necessary. All wiring and connections should be checked. Rosin flux

#### REPAIR SECTION

#### ELECTRICAL SYSTEM - Continued

#### Disassembly of the Generator - Continued

should be used in making all sol- 2. Unsteady or Low Output. dered connections. Acid flux must never be used on electrical connections.

#### Checking an Inoperative Generator

Several conditions may require removal of the generator from the engine and further checking of the generator, as follows:

1. No output.
2. Unsteady or low output.
3. Excessive output.

4. Noisy generator.

#### 1. No Output.

are making good contact with commutator and commutator looks okay, use test leads and light and check as follows:

a. Raise grounded brush, check with test points from "A" terminal to frame. Light should not light. If it does, the generator is grounded; raise other brush from commutator and check field, commutator and brush holder to locate ground.

b. If generator is not ground-ed, check field for open

circuit.
c. If the field is not open, check for shorted field. Field draw at 12 volts should be 1.5 to 1.67 amperes. Excessive current draw indicates shorted generator is reinstalled on the engine, or at any time after

and check on growler for short circuit.

Check as follows:

a. Check drive.

b. Check brush spring tension and brushes for sticking.

c. Inspect commutator for roughness, grease and dirt, dirt in slots, high mica, out of round, burned bars. With any of these conditions, the commutator must be turned down in a lathe and mica undercut. In addition, with burned bars which indicate open circuit, the open circuit condition must be eliminated or the armature replaced.

#### 3. Excessive Output.

Remove cover band and check for sticking or worn brushes and burned commutator bars. Burned bars, with other bars fairly clean, indicate open circuited coils. If brushes are making good context with disconnecting lead from "F" terminal of generator with the generator operating at a medium speed will determine if the generator is at fault. the output drops off, the field is grounded externally. If the output remains high, the field is grounded in the generator, either at the pole shoes, leads, or at the "F" terminals.

#### 4. Noisy Generator.

Noisy generator may be caused by loose mounting, drive unit, worn, dry or dirty bearings, or by improperly seated brushes. Brushes may be seated by using brush seating stone, referred to above.

field.

d. If trouble has not yet been located, remove armature engine, or at any time after leads have been disconnected and then reconnected to the genera-

#### Checking an Inoperative Generator - Continued

tor, a jumper lead should be connected MOMENTARILY between the BATTERY and GENERATOR terminals of the cut-out relay, before

starting the engine. This allows a momentary surge of current from the battery to the generator which correctly polarizes the generator with respect to the battery it is to charge.

#### Starting Motor Specifications

Clockwise rotation viewing the drive end.

Brush spring tension . . . . . . . . . . . . . . . 2.25 to 2.50 lbs.

Lock torque. . . . . . . . . . . . . . . . 55 ft.-lbs. - 700 amperes - 5 volts.

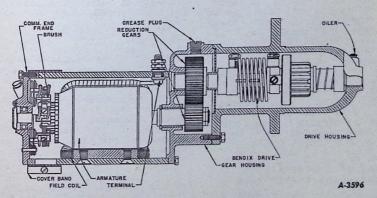
The Delco-Remy Model 756 Starting Motor is a heavy-duty, 12-volt gear-reduction unit with an internal reduction of 1.7 to 1. All bronze bushings exbearings are cept for a ball bearing in the com-Lubrication is promutator end. vided for each bearing by dust-proof hinge cap oilers. The Bendix drive, keyed to the drive shaft, automatically engages the cranking pinion with the flywheel ring gear when the armature begins to revolve. When the engine fires, the over-running effect of the flywheel on the pinion disengages it from the flywheel.

# Maintenance of the Starting Motor

Starting motor maintenance may be divided into two sections, normal maintenance required to assure continued operation of the motor and the checking and repair of an inoperative starting motor.

#### Normal Maintenance of the Starting Motor

Lubrication: Put 8-10 drops of light engine oil in the hinge cap oilers every 250 hours. Do not oil excessively. Never oil commutator.



Illust. 29 Cross Section of Starting Motor.

#### Normal Maintenance of the Starting Motor - Continued

The reduction gear case may be repacked with graphite grease every 6 months.

Inspection: The cover band should be removed periodically and the brushes and commutator inspected. If the commutator is dirty, it may be cleaned with No. 00, sandpaper. NEVER USE EMERY CLOTH TO CLEAN COMMUTATOR. If the commutator is rough, out of round, or has high mica, it should be turned down in a lathe and the mica undercut. The mica should be cut away to the depth of 1/32-inch. Worn brushes should be replaced. If brushes wear with excessive rapidity, check for excessive brush spring tension, roughness or high mica of the commutator.

# Disassembly of the Starting Motor

At regular intervals, depending on the type of service, the starting motor should, be disassembled for cleaning and inspection of all parts. The Bendix drive should be cleaned and oiled with a penetrating oil, as any accumulation of dirt on the drive might restrict the free movement of the pinion. Never clean the armature and field coils in a degressing tank, or with grease dissolving materials since these may damage the insulation. The commutator should be trued in a lathe and the mica undercut if necessary. Replace all parts showing excessive wear. All wiring and connections should be checked. Rosin flux should be checked. Rosin flux should be used in making soldered connections. Acid flux must never be used on electrical connections. Submit reassembled unit to NO LOAD and LOCK TORQUE TESTS.

#### Checking of Improperly Operating Starting Motor

If the starting motor does not develop rated torque and cranks

the engine slowly or not at all, check the battery, battery terminals and connections and the battery cables. Corroded, frayed or broken cables should be replaced and loose or dirty connections corrected. The starting motor control switch should be checked for burning contacts and the switch contacts cleaned or the switch replaced if necessary. If all these are in order, remove the cover bank of the starting motor and inspect the brushes and commutator. The brushes should form good contact with the correct brush spring tension. A dirty commutator can be cleaned with a strip of No. 00 sandpaper held against the commutator with a strick while the starting motor operates. NEVER USE EMERY CLOTH TO CLEAN COMMUTATOR. If the commutator is very dirty, or burned, or has high mica, remove the armature from the starting motor and take a cut off the commutator in a lathe. The mica should be undercut to a depth of 1/32-inch.

for cleaning and inspection of all parts. The Bendix drive should be cleaned and oiled with a penetrating oil, as any accumulation of dirt on the drive might pestrict the free movement of the pinion. Never clean the armature and field coils in a degressing tank, or with grease dissolving materials since these

Tight or dirty bearings will reduce armature speed or prevent the armature from turning. A worn bearing, bent shaft, or loose field pole screws will allow the armature to drag on the pole shoes, causing slow speed or failure of the armature to revolve. Check for these conditions.

If the brushes, brush spring tension and commutator appear in good condition, the battery and

# Checking of Improperly Operating Starting Motor - Continued

external circuit found satisfactory, and the starting motor still does not operate correctly, it will be necessary to remove the starting motor for no-load and torque checks.

#### No-Load Test

Connect the starting motor in series with a battery of the specified voltage and an ammeter capable of reading several hundred amperes. If an R.P.M. indicator is available, read the armature R.P.M. in addition to the current draw.

#### Torque Test

It is advisable to use in the circuit a high current carrying variable resistance, so that the specified voltage at the motor can be obtained. A small variation of the voltage will produce a marked difference in the torque developed.

# Interpreting results of NO-LOAD AND TORQUE TESTS

- 1. Rated torque, current draw and no-load speed indicates normal condition of starting motor.
- Low free speed and high current draw with low developed torque may result from:
  - a. Tight, dirty, or worn bearings, bent armature shaft or loose field pole screws which would allow the armature to drag.
  - b. Shorted armature. Check armature further on growler.
  - c. A grounded armature or field. Check by raising the grounded brushes and insulating them from the commutator with cardboard and then checking with a test lamp between the insulated terminal and the frame. If test lamp lights, raise other brushes from

commutator and check fields and commutator separately to determine whether it is the fields or armature that is grounded.

- Failure to operate with high current draw:
  - a. A direct ground in the switch, terminal or fields.
  - b. Frozen shaft bearings which prevent the armature from turning.
- 4. Failure to operate with no current draw:
  - a. Open field circuit. Inspect internal connections and trace circuit with a test lamp.
  - b. Open armature coils. Inspect the commutator for badly burned bars. Running free speed, an open armature will show excessive arcing at the commutator bar which is open.
  - c. Broken or weakened brush springs, worn brushes, high mica on the commutator, or other causes which would prevent good contact between the brushes and commutator. Any of these conditions will cause burned commutator bars.
- 5. Low no-load speed, with low current draw indicates:
  - a. An open field winding.
    Raise and insulate ungrounded brushes from commutator and check fields
    with test lamp.
  - b. High internal resistance due to poor connections, defective leads, dirty commutator and causes listed under 4.c. above.
- 6. High free speed with low developed torque and high current draw indicates shorted fields. There is no easy way to detect shorted fields, since the field resistance is already low. If shorted fields are suspected, replace the fields and check for improvement in performance.

# REPAIR SECTION

# MEMORANDA

#### ENGINE

## Specifications

Bore and Stroke, inches
Number of Cylinders 6
Type of Cylinders Wet Sleeves
Displacement, Cu. In. per Rev 691
Governed R.P.M
Governed High Idle Speed, R.P.M 1330
Governed Low Idle Speed, R.P.M 425
Piston Speed, Feet per Minute at 1200 R.P.M 1300
Compression Pressure, Lbs 465
Compression Ratio
Fuel Diesel Fuel

#### Air Cleaner

# A Donaldson 10" oil-washed air cleaner with an oil cup is used on this tractor. The intake is provided with a screen to prevent large particles such as chaff, leaves, etc., from entering the air cleaner. The air passes through the screen, down the center into the oil cup, and up through screens to the intake manifold. Reversal of air flow at the base separates dust from the air. The oil carried upward with the air as a mist is separated from the air by crimped screen elements, returning the oil to the base and washing the crimped screens.

The oil cup should be removed for periodical cleaning and refilling with fresh oil to the proper level. Screens should be washed with kerosene. Joints, rubber connections, etc., should be air tight to prevent entrance of dirt particles. Refer to the "Operations Section" for complete servicing of the air cleaner.

Proper functioning of the air cleaner is important to obtain maximum power from an engine. A restricted air cleaner will cause a loss of power.

## Manifold

The intake manifold is of the combination type, using a poppet-type valve to bypass air through a gasoline carburetor for starting purposes only. The function, operation, and service of the manifold assembly is covered under the "Starting System", Section 10. The manifold assembly as removed from the engine consists of the starting carburetor with primer, the air valve assembly with magneto cut-out switch, and the intake manifold.

The entire unit can be removed after disconnecting the fuel line to the carburetor; removing cotter keys and slipping out the primer control rod, choke control rod, air valve control rod, and air valve operating rod; disconnecting the magneto grounding wire inside the air valye housing; removing the nuts holding the manifold to the cylinder head; and removing the air pipe from the air cleaner to the manifold.

Replacement is the reverse of the above. Be sure gaskets are in good condition. Tighten manifold nuts to 75 ft.-lbs. torque.

When the entire unit is serviced, or parts replaced, refer to "Start-ing System", Section 10.

#### Lubrication

Capacity, U.S. Quarts	25	S
Full Pressure System.	Yes	5
Oil Filter, Model	N-1726	3
Oil Pressure, Lbs	60	0
Oil Pressure Valve In O	il Pump Bod	y

Full force-feed lubricates the crankshaft bearings, camshaft bearings, connecting rod bearings, piston pins, valve mechanism, and timing gears.

#### Oil Pressure

The oil pressure is controlled by a plunger-type regulating valve located in the oil pump body set at 60 lbs. pressure. The oil regulating spring should test 47.6 lbs. at 2-3/32 inches while the free length is 3-3/32 inches.

The pressure valve 0.D. is .900-inch to .901-inch, and the bore in the Purclator base is .905-inch to .906-inch, or the clearance for the valve is .004-inch to .006-inch. Be sure the valve slides freely and that the spring does not cock the valve in the bore, seating improperly.

Valve springs take a set after continued use - hence their free length may be somewhat shorter than the dimensions listed in the engine specifications. The best way to check these springs is to load them with the weight specified and measure their length at this load which is equivalent to the conditions existing when the valve spring is in the operating position. Valve springs falling below this standard should be replaced.

#### Oil Filters

Two N-1726 absorption-type lubricating oil filters are accessibly located on the left side of the engine. A quantity of oil is bypassed from the main circulatory system, through the cleaning element to the crankcase. Filter el-

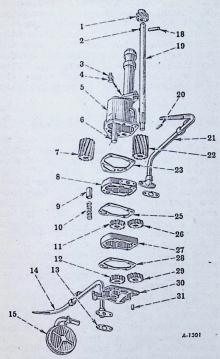
ements should be removed every time the oil is changed, or oftener if necessary. Be sure the end of the element with the wire loop for removal is toward the top of the filter case.

#### Circulation

The path of lubricating oil is from the sump and through a "Float-o" oil screen from where it is pumped under pressure to the Purolator filter base. A passage leads from the base to the filters and is known as the bypass. A portion of the oil is bypassed through the filters, the amount depending upon the cleanliness of the filter elements. The filtered oil drains back into the crankcase. The pressure regulating valve in the pump body maintains the proper pressure on all bearings and at the same time protects the system and pump mechanism when thick oil caused by severe weather conditions builds up high pressure in the oil lines. The oil passed through the filters is returned to the sump as is the oil that is bypassed by the pressure relief valve. Oil is distributed into rifle-drilled passages in the crankcase from where it is directed to the main bearings.

Oil from the main bearings passes through drilled passages in the crankshaft to the connecting rod bearings from where it is directed through the drilled passages in the connecting rods to the piston pins and cylinder walls.

Oil passages also lead to the camshaft bearings and timing gears. Other passages lead from the rear camshaft bearing and extend upward through the crankcase to the valve rocker mechanism. The valve lever shaft is hollow and distributes oil to the valve levers, valve stems, and starting mechanism. The oil is drained back to the sump through the valve push rod holes in the crankcase and in so doing it lubricates the valve tappets and cams. A valve oiler pad over the valve levers is kept saturated with oil from drilled holes in the top of the valve lever.



Illust. | Exploded View of the Oil Pump.

Pump

This is a three-stage, triple-gear type of pump which operates off the worm gear at the center of the camshaft. The main set of gears supplies oil to the lubricating system; one auxiliary set of gears pumps oil from the front of the engine; the other auxiliary set pumps oil from the rear of the engine oil pan, returning the oil to the sump.

#### Removal of the Oil Pump

Removal of the oil pump requires taking off the crankcase guard and removing the oil pan. Then remove cap screws from the front and rear

Ref.	Description
1 2 3 4 5 6 7 8 9 10 112 13 14 15 18 190 221 22 35 26 27 28 29 301	Pinion (14 teeth).  Key. Lock washer. Cap sorew. Body with shaft. Idler gear shaft. Idler gear (12 teeth). Housing, upper. Regulating valve. Spring. Auxiliary idler gear (12 teeth). Gasket. Oil return pipe, front. Float. Pin. Shaft with pin. Pin. Oil return pipe, rear. Body gear (12 teeth). Housing gasket, upper. Housing gasket, lower. Auxiliary body gear (12 teeth). Housing, lower. Cover gasket. Auxiliary body gear (12 teeth). Cover with pin. Dowel pin.

oil return pipes (14) and (21), Illust. 1. Gaskets (13) are attached to the pipes. Take the wire from the cap screws (4) which secure the pump to the engine and withdraw the unit from the crankcase.

# Disassembly of the Oil Pump

Remove the cotter pin from the pump cover (30) and take out the oil screen or float (15). Then remove the cap screws from the cover and withdraw it. The dowel pin (31) locates the cover on the lower housing (27).

The auxiliary idler gear (12) and the auxiliary body gear (29) (square bore) can be lifted from the lower

# Disassembly of the Oil Pump - Continued

housing. Gasket (28) is attached to the cover (30).

The lower housing (27) can be slid off the pump shafts (6) and (19). Gasket (25) is attached to the housing.

The second set of auxiliary gears (11) and (26) can then be removed. The upper housing (8) can be slid off the pump shafts and gasket (23) is attached to this housing. The oil pressure regulating spring (10) and the regulating valve (9) can be lifted out. Then slide the idder gear (7) off the idler gear shaft (6).

Removing pin (18) from the driving pinion (1) permits pulling the pinion from shaft (19). The key (2) locates the hole in the shaft and the hole in the pinion. Shaft (19) with the body gear (22) can now be slid out of the pump body (5). The body gear is pinned to the shaft (19) by means of the pin (20).

#### Service of the Oil Pump

The clearance between the pressure regulating valve (9) and the bore in the body (5) is .004-inch to .006-inch. Be sure that the valve slides freely and that the pressure regulating spring (10) does not cock the regulating valve (9) in the bore.

The backlash of the gears can be .003-inch to .006-inch. The gaskets between the body, the housing, and the cover are .006-inch thick. The shaft (19) with the pinion (1) and the body gear (22) assembled should have .003-inch to .005-inch end play when the upper housing (8) is assembled to the pump body (5).

The idler gear shaft (6) should be concentric with the body bore and should square with the bottom of the gear chamber within .001-inch. The body gear (22) and the idler

gear (7) should have .006-inch to .007-inch clearance between the body bore and the outside diameter of the gears. Use a 1/2-inch wide feeler gauge between the body and the gear; turn the pinion several revolutions when doing so. The feeler gauge should move along the bore while the gears revolve past it.

#### Reassembly of the Oil Pump

With the key (2) in lower end of shaft (19), press on the gear (22). Drive the pin (20) into the shaft. Press the idler gear shaft (6) into the pump body (5) so the lower end is 3-5/32-inches from the bottom surface of the body. Slide shaft (19) and gear (22) in the body (5), press gear (1) on the end of the shaft, and drive the pin (18) into the shaft and gear. Be sure pins driven in gears are flush with the bottom of the teeth and will not interfere with the teeth of the meshing gear. Slide the auxiliary idler gear (12) on its shaft (6), attach the housing gas-ket (23) to the pump body with a light coat of grease and put the upper housing (8) in place. With the housing held tight against the body, there should be .003-inch to .005-inch end play. Add another gasket if necessary to get this clearance. Remove the upper housing, place the regulating valve (9) in place with its spring (10), and reattach the upper housing (8), using the 3/8-inch cap screw.

Slip the auxiliary gears (11) and (26) on their respective shafts, attach the gasket (25), and hold the lower housing (27) in position to observe the end clearance of the auxiliary gears. Use additional shims (25) if necessary. Follow the same procedure for the auxiliary gears (12) and (29) when attaching the cover (30) with its gasket (28). Dowel pins locate these parts one on the other. Attach the "Float-o" oil screen to the cover (30) and insert the cotter key. The end of the pipe on the screen may be rebabbitted and

#### Reassembly of the Oil Pump -Continued from Page 4

refitted to the cover. The pump is ready for replacement on the engine after lubricating the gear (1) and shaft (19).

#### Replacement of the Oil Pump

Push the oil pump into place in the crankcase and attach with the two cap screws (4). Rewire the heads of the bolts. Attach the front and rear oil return pipes (14) and (21) to the crankcase and the cover (30) and upper housing (8), using the gasket (13). Reattach the oil pan (16) with the gasket (32) in place.

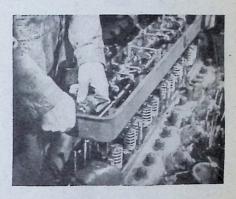
#### Cylinder Head

The cylinder head is made up of two sections, with the water passages connected by a water manifold. Each head can be removed independent of the other. The cylinder head gasket is assembled to the block with the three elongated holes toward the injection pump side. The gaskets used for both the front and rear cylinder heads are identical. The gasket is reversible. Copper gasket rings located on top of the sleeves assure a gas-tight seal between the head and the sleeve. The flange side of the copper rings should always be on top.

#### Removal of the Cylinder Heads

Remove the valve housing cover (13), Illust. 3, and the valve rocker lubricating felt (16). Then unhook the cross shaft spring and take out the cotter keys and pins in the two control rods "DD" and "G", Illust. 1, Section 10. The valve lever assembly can be removed by taking out the nuts progressively around the outer edge, then the cap screws and nuts on the brackets, and finally the five larger nuts from the long studs in the cylinder heads. Keep the assembly level when lifting it off as a

unit. (See Illust. 2.) Then remove the valve push rods (62), Illust. 3.



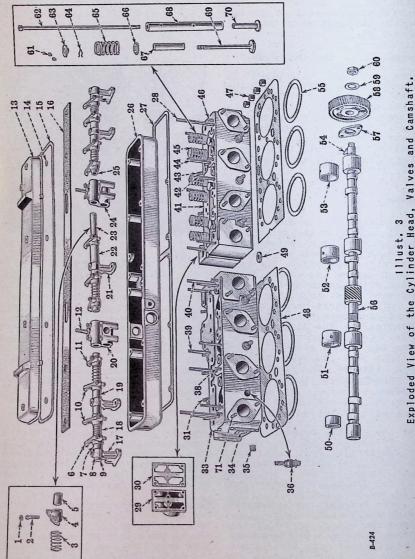
Illust. 2
Lifting off the
Valve Lever Assembly.

Disconnect the tubing from the fuel injection pump and the nozzles, and place caps on the injection pump to protect it from dirt. If new cylinder heads are being installed, the nozzles and retainers must be removed. They come out as complete assemblies and the spacers and gaskets are lifted out separately.

The water manifold (29), Illust. 3, which connects the front and rear cylinder heads then comes off with its gasket (30). The pipe from the air cleaner to the manifold can be lifted off after the clamp is loosened and the cap screws on the manifold have been taken out.

Disconnect the carburetor choke control, the fuel shut-off control rod, and the primer control. Then close the valve on the gasoline tank and disconnect the line from the carburetor. Take off the plate with the gasket from the housing (Continued on page 8.)

Cylinder Head, Valves, Etc.



Exploded View of the Cylinder Head, Valves and Camshaft.

# Cylinder Head, Valves, Etc. - Continued

Description	Bracket stud, intermediate. See detailed illustration. Valve lever bracket stud. Stud nut. Gasket, front and rear. Center stud washer.	Dearing, No. 5. Bearing, No. 2. Rey. Gasket ring. Camshaft.	Plate. Gear. Nut lock. Nut. Valve spring collar key. Push rod. Upper seat. Retainer. Valve spring.	Lower seat. Valve guide. Guide. Exhaust valve. Intake valve. Valve tappet. Manifold gasket.
Ref.	44 44 44 44 44 44 44 44 44 44 44 44 44	25.52.25.25.25.25.25.25.25.25.25.25.25.2	00000000000000000000000000000000000000	66 68 69 70 71
Description	Shaft (front and rear). Housing. Housing gasket. End bracket stud. Water manifold. Gasket. Nozzle body stud. Oylinder head, rear,	Cylinder head, rear, with valves. Expansion plug, 1-1/8". Spark plug, (Champion	Spark plug (AC No. 18) (optional).  Valve lever bracket stud (short).  Valve housing stud.  Hex. nut, 5/8" N.F.  Bracket stud, inter- mediate.	Cylinder head, front, with valves.  Cylinder head, front, less valves.  Valve lever bracket stud.  Nozzle body stud.
Ref.	25 26 28 28 29 30 31	88 88 48	36 38 39 40	41 42 42
Description	Nut. Adjusting screw. Valve lever spring. Valve lever with bushing, right hand. Bushing. Valve lever with bushing, Slaret hand. Snacer. outer.	Retainer ring. Shaft plug. Valve lever with bushing, straight. Valve lever with bushing,	Front center bracket stud. Sover. Washer. Washer. Felt. Felt. End bracket.	Spacer, intermediate. Cross shaft bracket with Bracket, intermediate. Spacer, center. Shaft, center. Front center bracket with stud.
Ref.	1004 50 5	11 10	21 21 21 21 21 21 21 21	25 25 25 25 25 25 25 25 25 25 25 25 25 2

# Removal of the Cylinder Heads - Continued

above the carburetor, disconnect the wires from the terminals in the housing, and then pull them out.

Remove the intake manifold assembly and the gaskets and also the exhaust manifolds and their gaskets. Spark plugs can be taken out but it is not necessary to do this unless new cylinder heads are being installed.

Remove three cap screws from the thermostat housing to take it off.

Before taking off the rear cylinder head, two bolts must be removed from the dash. Remove the stud nuts and lift off the cylinder head assemblies. Removal of the gaskets (48) and the copper rings (55) clears the top of the block.

#### Disassembly of the Cylinder Heads

Place the cylinder heads on a bench with a small block to support the valves when the springs are depressed. Be sure to keep the valves in order and replace them in their original positions.

To remove the valves, depress the upper seat and remove the keys. Lift off the upper seat and the spring and remove the retainer and lower seat. Tip the head on its side and withdraw the valves.

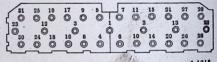
To remove the starting valves, take the cotter key from the retainer and unscrew it. The valves can then be removed from the head. Be sure to keep the valves in proper order.

#### Replacement of the Cylinder Heads

Valve guides (68), Illust. 3, in the heads are replaceable. They are assembled with the chamfered end to the top. The top of the starting valve guide (12), Illust. 4, is 15/16-inch below the upper

surface of the head. The exhaust and intake valves (69), Illust. 3, are 1-3/8-inch above the surface. Be sure to clean the lower surface of the cylinder heads and also the top of the block before putting the heads on the crankcase. Put new gaskets in position with the numbered side up. Be sure to place the copper rings on top of the cylinder sleeves with the flanged side up.

Check the heads for alignment with a straight edge across the manifold side. The center stud nut has a washer (49), which contacts both heads. Run all the stud nuts down with a speed wrench. Starting at the center nut, follow the pattern indicated on the Nut Tightening Sequence Chart, Illust. 4, and snug up each nut. After easily and uniformly drawing down all nuts in gradual steps, go over them again with a torque wrench, and then again, by gradual steps, draw them all down to 170 ft.-lbs. torque. Torque wrench SE-1137 (0-100 ft.-lbs.) and extension bar SE-1137-1 (60-175 ft.-lbs.) are available.



A-1218

Cylinder Wead But Tightening Sequence Chart.

Replace the valve push rods (62), Illust. 3, and be sure they are in the tappet sockets. When the rear cylinder head has been removed, be sure to replace the two cap screws on the dash.

Put a new gasket between the housing and cylinder heads, lower the valve assembly onto the heads, and then loosen all of the valve lever screws before tightening the housing nuts. Start the cap screws and nuts on the brackets, then start the five large nuts on the studs,

Replacement of the Cylinder	Stem Diameter
Heads - Continued and finally the nuts around the	Intake Valves 432 in
outer edge. Tighten the cap screws and nuts evenly in the order of their replacement.	Exhaust Valves 431 in
Assemble the gasket (30) and water	Stem Clearance in Guide
manifold (29) which connects the water jackets with the front and rear cylinder heads. Replace the nozzles and retainer assemblies in	Intake Valves
the heads after inserting the noz- zle gaskets and spacers. Be sure	Exhaust Valves
that the word "up" on the spacers faces towards the valve housing. Then connect the tubing between	Tappet Clearance, Hot018 in.
the injection pump and the nozzles. Fasten the thermostat housing, being sure to put a new gasket in place.	Valve Spring, Free Length
	Valve Spring Test50-56 lbs. at 2-1/2 in.
The exhaust manifold gaskets are shaped to go on only one way. When they are in place, the manifolds can be secured to the cylinder	Valve Lever Shaft, Diameter
heads. Then replace the spark plugs, connect the wires, and lift the intake manifold assembly into position and tighten it. Connect	Valve Lever Clearance in Bushing
the primer and carburetor choke controls, the fuel shut-off control rod, the gasoline line, and the wires of the intake manifold.	Valve Lever Bushing, Length 1.250 in.
	Intake Valves
Refer to the "Starting System", Section 10, to adjust the controls and starting valve clearance.	Material MD-3140
	Head Diameter 2 in.
Then connect the pipe from the air cleaner to the manifold. Readjust	Port Diameter 1.780 in.
the valves as described in the "Operations Section".	Lift 1/2 in.
	Valve Opens 100 before TC
Valves	Valve Closes 25° after LC
Specifications	
Valve Seat Width 3/32 in.	Exhaust Valves Material
Valve Seat Angle 45°	Head Diameter 1-3/4 in.
Stem Guides (Replaceable)	Port Diameter : 1.530 in.

## REPAIR SECTION

#### **ENGINE** - Continued

Exhaust Valves - Continued
Lift 1/2 in.
Valve Opens 430 before LC
Valve Closes 10° after TC
Starting Valve
Starting valve
Material Silchrome No. 2
Head Diameter 1-9/32 in.
Stem Diameter
Valve Guide Replaceable
Clearance in Guide0015 in
Valve Seat Width 3/64 in.

#### Removal of the Valves

Removal of valve mechanism is covered under the "Cylinder Head".

Removal of the intake and exhaust valves (69), Illust. 3, is the same as that for regular automotive-type valves. If the head of the valve is supported, pressing down on the spring upper seat (63) allows the two valve spring collar keys (61) to be removed. Then remove the seat (63) and spring (65). Pull off the retainer (64) and pull the valve out of the head. Grind valves to 3/32" seat width.

Valve guides (67) are replaceable.

The starting valves (13), Illust. 5, are removed by taking the cotter key out of the spring retainer (10) and unscrewing the retainer while holding the head of the valve. The guide (12) is replaceable.

When assembling starting valves, turn down the retainer with the valve on its seat until the top of the retainer is .200-inch to .270 inch from the top of the cylinder head as shown in the "Engine Service Chart", Section 14.

#### Disassembly of the Valve Mechanism

The valve mechanism can be disassembled if necessary to check the wear of the valve lever bushings. Remove the nut from taper pin (3), and then drive the pin (3) out of the inner lever (5). Then pull the starting valve cross shaft (15) from the assembly. The valve assembly can then be separated from the valve housing (26), Illust 3.

Loosen the lock nuts of the headless set screws in the brackets (20) and (24), and turn out the set screws.

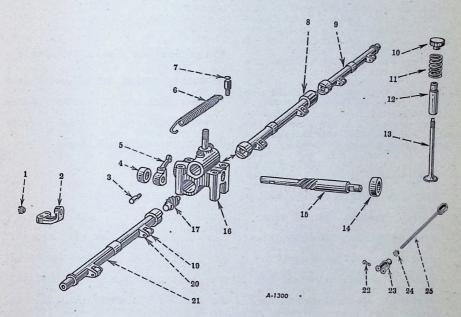
The valve mechanism assembly can then be separated into seven separate units. These are (6) to (12) inclusive and (17) to (25) inclusive. The other parts belonging to the starting valves are (8) and (9), and (17) to (21) inclusive, Illust. 5. The oil seals (4) and (14) fit in the valve housing, flush with the outside face on the housing.

The valve levers such as (6), (10), or (11), Illust. 3, can be pulled off the valve lever shafts (25) and (23) together with springs (18) and spacers (7), (19), and (22). The bushings (5) in the valve levers (6), (10), and (11), can be replaced and reamed according to the specifications. The wear of the valve lever shaft can be observed by comparing the shaft size with the specifications.

#### Reassembly of the Valve Mechanism

When replacing the valve levers on the shaft, be sure the spacers are in the correct place and that the right, left, and straight levers are in the proper place. Analyzing each group of four, the center two are straight, with a left and a right at the respective ends.

# Starting Valve Mechanism



Illust, 5
Exploded View of the Starting Valve Mechanism.

Ref. No.	Description	
1	Cross shaft thrust screw.	UPPER DEAD CENTER
1 2 3 4 5 6 7 8 9	Cross shaft thrust bracket.	
3	Pin.	WITHE COCKE
4	Oil seal.	INTAKE OPENS 100-
5	Inner lever.	10 - EXHAUST CLOSES
6	Cross shaft spring.	. In Edition Cross
7	Spring anchor stud.	
8	Shaft, center.	
9	Shaft, front.	
10	Spring retainer.	
11	Starting valve spring.	INTAKE OPEN 215°
12	Guide.	EXHAUST OPEN 233°
13	Starting valve.	2/1/1057 67 211 205
13 14 15 16	Oil seal.	
15	Starting valve cross shaft.	
16	Bracket.	
17	Gear (8 teeth).	/ T SWINGTOONS
19	Roller.	25° + 43° EXHAUST OPENS
20	Pin.	INTAKE CLOSES
21	Shaft, rear.	A-1311
22 .	Air valve control rod pin.	
23	Air valve control rod yoke.	
24	Nut, 1/4 in.	Illust, 6
25	Air valve control rod, cp.	Engine Valve Timing Diagram.

#### Reassembly of the Valve Mechanism - Continued from Page 10

Reassembly of the remainder is the reverse of the removal procedure. When replacing valve springs on the cylinder heads, be sure the end of the spring, when the coils are close together, is assembled against the cylinder head.

Adjust the valve tappet clearance as described in the "Operations Section", and then readjust after the engine is hot. Connect the outer lever to the starting mechanism. Check clearance between rol-

lers and starting valves. If it is not .060-inch see the "Starting System", Section 10, for adjustments.

#### Valve Service Tools Available

SE-691-1, Intake Valve Seat Reamer SE-904, Exhaust Valve Seat Reamer SE-903, Valve Seat Reamer Pilot SE-640, Valve Guide Reamer

#### Camshaft

Bearings, Number 4
Bearing Material (Steel Back) Babbitt
Bearing Journal Diameter, Front
Bearing Journal Diameter, 2nd 2.4305 in2.4315 in.
Bearing Journal Diameter, 3rd 2.368 in2.369 in.
Bearing Journal Diameter, Rear 1.9305 in1.9315 in.
Running Clearance
Bearing Length, Front 2-5/16 in.
Bearing Length, 2nd and 3rd
Bearing Length, Rear 1-5/16 in.
Thrust Plate Material
End Clearance
Camshaft Drive
Number of Teeth in Gear 54
Pressure Lubricated

The slot in the rear bearing journal allows a small amount of oil to flow from the header in the crankcase to the valve lever mechanism with each revolution of the camshaft.

#### Removal of the Camshaft

In the removal of the camshaft (56), Illust. 3, from the cylinder block, it is assumed that the engine has been removed from the

# Removal of the Camshaft - Continued

tractor. The fuel injection pipes should be removed to prevent damage when the crankcase is laid on the pump side for crankshaft service.

Remove the valve lever assembly and the push rods as described under the "Cylinder Head" in this section. Remove the oil pan, the crankcase front cover, and the oil pump as described under those subjects. Remove the idler gear (29), Illust. 9, by bending back the corner of the bolt lock (31) and removing the cap screws through the thrust washer (30).

Turn the camshaft gear (58), Illust. 3, until the hole in the gear lines up with the head of the cap screw holding the thrust plate. Then remove the cap screw. Repeat the operation to remove the second cap screw. Reach up from the bottom of the crankcase and push the tappets (70) toward the top of the crankcase as far as they will go. The camshaft can now be removed from the crankcase by pulling on the gear (58). Bend the washer (59) down and remove the nut (60). Using a gear puller, remove the gear (58) from the camshaft and take off the thrust plate (57), and the key (54).

### Repair of the Camshaft

Inspect the camshaft bearing journal surfaces and check to the dimensions given in the specifications. The groove in the rear bearing journal meters oil through the valve lever-arm assembly.

In order to facilitate the replacement of the camshaft bearings (50), (51), (52), and (53), remove the flywheel and the rear engine support (4), Illust. 9, and drive out the plug (15) in the rear of the crankcase by using a long bar placed against the plug from the front end of the crankcase and tapping with a hammer; or by drilling a hole in the plug to pull it out.

Drive out the bearings by using a brass rod placed against the edge of the bearing and tapping. Move the end of the rod around the edge of the bearing as tapping proceeds, to prevent the bearings from jamming in the boss.

Replacement bearings are furnished reamed to size. In replacing the bearings, be sure all the holes in the bearings line up with the holes in the crankcase. The front bearing (53), Illust. 3, is pressed flush with the front end of the crankcase by placing a block of wood across it and tapping with a hammer. Be sure the bearing is started square with the crankcase so that it does not bind. Repeat the above procedure for the two center bearings (51) and (52), pressing them flush with the boss inside the casting. Drive the rear bearing (50) so that the inner end is 1/8-inch inside the inside end of the boss in the crankcase.

### Replacement of the Camshaft

Place the thrust plate (57), Illust. 3, on the camshaft (56) with the countersumk surface toward the threaded end of the shaft. Insert the key (54) in the shaft and press on the gear (58) - 54 teeth. Be sure the lettered side of the gear is outside. Then put on the nut lock (59) and the nut (60).

Place the camshaft in the crankcase and tighten the two cap screws - 1/2-inch by 1-1/4-inch on the thrust plate (57). Be sure the face of the gear (58) runs true with the front plate (28), Illust. 9, on the engine. If this is not done, the timing gears will be noisy. Clearance between the thrust plate and the gear, when all are assembled should be .005-inch to .011-inch.

Replace the idler gear (29), Illust 9. The gears are punch-marked "C", "P", and "S". Be sure all marks correspond when the idler gear is slipped on the shaft. Replace the idler thrust washer, bolt

## REPAIR SECTION

#### **ENGINE** - Continued

# Replacement of the Camshaft - Continued

lock (30), and tighten the cap screws. Lock the idler cap screws by bending down the corners of the bolt lock. The engine is now timed.

The magneto gear, with the bracket and magneto, can also be replaced and timed. Refer to "Timing Gears" in this section.

Replace the crankcase front cover as described under that subject, and the oil pan. Replace the plug in the rear of the crankcase with a new one. Place a good sealer on the edge of the plug and put the plug in the crankcase. Using a bar slightly smaller than the plug, set the plug by striking the bar with a hammer.

Replace the rear engine support (4), and all other parts removed.

#### Connecting Rods

Length, Center to Center 13-1/4 in.
Crank Pin Diameter
Bearing Material Copper Lead, Steel Back
Bearings, Length (Total) 2-1/16 in.
Bearings, Running Clearance
Rod, End Clearance
Bolts, Number 4
Bolts, Material
Bolts, Size
Bolts, Torque, ftlbs 70

Connecting rods (16), Illust. 7, should be straight, free from twist, and parallel with the pistons. The cylinder numbers are stamped on the rod and cap - No. 1 starts at the front end of the engine. Assemble the numbered side toward the camshaft. The clearance may be checked by placing a .003-inch brass shim (1/4-inch by 1-1/4 - inch long) lengthwise between the lower bearing and the crankshaft. If the clearance is not excessive, there should be a slight drag when turning the crankshaft with the spark plugs removed.

When installing bearings (17) be sure that the bearing backs and rod surfaces are absolutely clean, smooth, and free from oil. The bearings have a nib engaging the milled notch in the rod and cap. The connecting rods are removed from the bottom of the crankcase. The piston and rod assembly can be taken out after turning the crank-shaft to the side so the piston will clear. Then pull down on the rod. Be sure the piston does not hit the shaft or crankcase. The correct position of the shaft is determined by the marks PP1, PP2, etc., on the flywheel as seen through the opening used for timing the engine. Bearing caps are held to the rods with four bolts (14) and nuts (15). A torque wrench should be used to tighten these bolts to 70 ft.-lbs. The nuts (15) have slotted heads for locking purposes. Tighten beyond 70 ft.-lbs. torque if necessary to make the holes in bolts (14) line up with slots in the nuts.

Piston	Assen	ably
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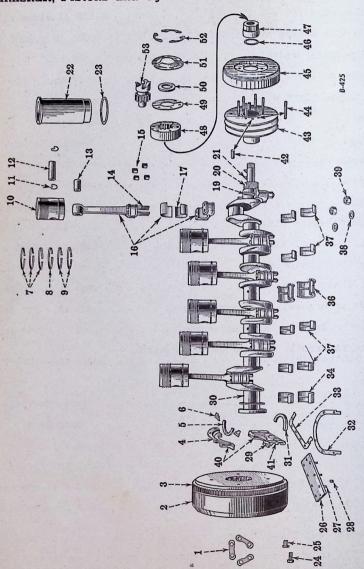
	Piston Material
	Clearance (at bottom of skirt)
	"Go" Gauge (1/2" wide)
	Light Pull 2-4 lbs.
	"No Go" Gauge (1/2" wide)
	Tight Pull
Pi	ston Rings
	Total Required 6
	Compression 4
	Oil Control
	Width, Compression Rings
	Width, Oil Control Rings
	Gap, Top Compression Rings
	Gap, All Other Rings
	Clearance in Groove, Top Compression
	Clearance in Groove, 2nd Compression
	Clearance in Groove, 3rd and 4th Compression and Oil Control (2)
Pi	ston Pin
	Type
	Retainers Snap Rings
	Length 4.105 in.
	Diameter
	Clearance in Rod Bushing
	Clearance in Piston Bore

The replaceable wet liner sleeves (22), Illust. 7, are select-fitted to pistons (10) to give the normal measured clearances as listed in the above specifications. The fourth compression ring (8) from the top of the piston is tapered

and should be assembled with the word "top" toward the top of the piston. Two oil regulating rings (9) fit in the two bottom grooves.

When replacing the rings, stagger the ring gaps around the piston.

# Crankshaft, Pistons and Cylinder Sleeves



Exploded View of the Crankshaft, Connecting Rods, Pistons and Cylinder Sleeves.

# Crankshaft, Pistons and Cylinder Sleeves - Continued

Description	Felt plug.  Dowel. Crankshaft with nut. Oil seal felt. Oil seal gasket. Front bearing. Front bearing. Front bearing. Intermediate bearing. Washer. Stud nut. Oil seal retainer. Grankshaft rear oil seal lower retainer. Plu. Pulley. Fulley. Stud. Vibration damper. Coupling. Shaft retainer. Felt washer.
Ref.	80001000 4 00000044 444444444440000000000
Description	Bolt lock. Flywheel with ring gear. Flywheel ring gear. Crankshaft rear oil seal upper retainer. Oil seal felt. Retainer gasket. Piston ring - compression (taper face). Piston ring - oil regulating. Piston with pin. Retainer ring. Fiston with pin. Piston with pin. Piston with pin. Redainer ring. Fiston with pin. Somecting red bushing. Rod, with bushing. Rod, with bushing. Rod, with bushing. Rod bearing Stud. Rey. Sleeve with ring. Ring. Ring. Bolt. Fig. Dowel pin. Plate with studs.
Ref.	1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2

#### Piston Pin - Continued

The ring grooves should be clean and free from carbon, and the oil holes in the oil control grooves should be drilled out. Fit the rings to the smallest section of the sleeve. Bathe the piston in oil before replacing it in the engine.

Piston pins (12) are the full-floating type secured in the piston bosses by retainer rings (11). Heat the piston in hot water to remove or install the pins. An oversize piston pin (.005-inch) is available marked +5 on one end or on one side. The piston bore should be reamed to give the clearances listed in the specifications.

#### Service Tools Available

Reamer Body. . . . SE-949

Reamer Blades. . . . SE-949-5

Pilot Bushing. . . . SE-949-15

Hone Blades. . . . . SE-949-10

Burnishing Bar . . . . SE-941

#### Cylinder Sleeves

Wet liner type sleeves (22), Il- tons and cylinder heads.

lust. 7, are used in this engine. They can be removed and replaced easily. They require no honing or boring after assembly. Standard piston and sleeve sets are available for service replacement. The sleeve puller SE-654 is available for removal of the sleeves. Remove the rubber sealing ring (23) from the block and clean the ring groove in the crankcase. Be sure to protect the crankshaft bearing journals with rags when cleaning out the water jackets.

Always use new sealing rings (23) and keep them free of oil and grease. Make a soap solution to which glycerine has been added (1/2 oz. of glycerine to a table-spoon of soap flakes and one quart of hot water). Apply this soap solution to the rings and place them in their grooves in the crankcase just prior to the replacement of the sleeves. Apply the same solution to the bottom of the sleeve on the outside finished surface and lower the sleeve into position. Be sure that the rubber sealing rings (23) are engaged all the way around on the taper of the sleeve. Then push the sleeve in place. Wipe out the inside of the sleeves before replacing the pistons and cylinder heads.

#### Crankshaft

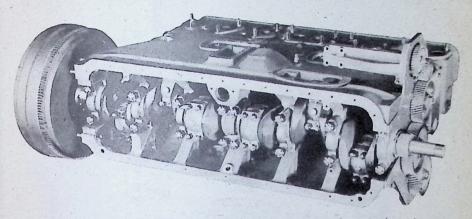
Drilled for Pressure Lubrication. . . . . . . . . . . . Yes

Bearing Journal Diameter. . . . . . . . . . . . . . . . . 3.4980 in. to 3.4985 in.

The crankshaft (30), Illust. 7, has Tocco-hardened bearing journals and is drilled for pressure lubrication of connecting rod bearings. Removal of the center main bearing (36) requires the removal of the oil pump. Check the end thrust of this bearing. The running clearance of the bearings can be checked by the same method as the connecting rod bearings. Each bearing cap carries a number which corresponds to a number stamped on the camshaft

side of the crankcase. The center main bearing has flange thrust surfaces. To remove the rear bearing, remove the small plate (26) below the bearing. A torque wrench should be used when pulling down the main bearing cap nuts. The amount of torque is 150 ft.-lbs.

Replacement crankshafts with bearings are available in .030-inch undersize.



Underside View of TD-18 Engine showing the Crankshaft Assembly and Timing Gear Train.

### Crankshaft - Continued

For servicing connecting rod and main bearings, with the engine in the tractor, the oil pan must be removed. However, when the engine is removed from the tractor the crankshaft is easily removed. Take off the front cover as described under that heading in this section. Remove the bolts from the flywheel (2), Illust. 7, and pull the flywheel from the shaft. Then remove the oil pan. Remove plate (26) and take off the rear oil seal retainers (4) and (41), with the felts (5) and (31), and gaskets (32) and (6). Then remove the cap screws and lift off the rear engine support plate. Remove the connecting rods, the oil pump, and the main bearing caps. Lift out the crankshaft.

When replacing, be sure that the bearing caps, bearings, crank journals, and crankcase are clean and absolutely dry. Place all of the upper bearings in the crankcase, replace the shaft, and attach the bearing caps after oiling the shaft and the bearings. Be careful that

the bearings of the caps do not jump out of place when tapping the cap in place. Start with the thrust bearing and tighten all stud nuts. Check the nuts with a torque wrench at 150 ft.-lbs. Tighten the nuts further if the holes in the studs do not line up with the slots in the nuts. When all of the nuts are drawn down, the shaft can be turned over by one hand.

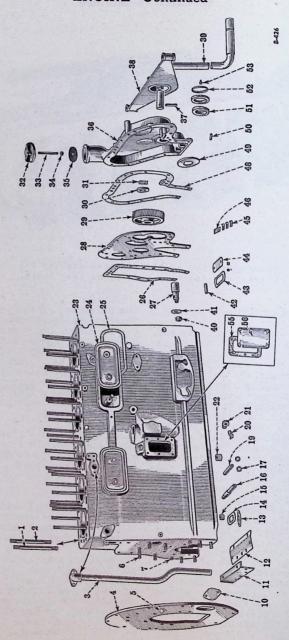
When replacing the flywheel, draw the bolts up to 150 ft.-lbs. torque. Be sure that the bolt locks (1) cover the dowel pins (25).

#### Oil Seals

Front and rear oil seals are provided. The front seal is composed of two felt rings, located in the crankcase front cover.

The rear oil seal is the split type. The flywheel must be removed to replace this oil seal. When the oil leaks behind the flywheel, check the fit of the welch plug at the rear of the camshaft, replace the felt, and check the rear main bearing for excessive wear.

Crankcase



Exploded View of the Crankcase.

# Crankcase - Continued

Description	Starting crank ratchet pin. Front engine support. Starting crank. Nut, 3/4" N.F. Nut lock. Dowel. Gasket. Plate. Screw strip. Screw strip. Front plate gasket. Oil filnger. Oil pan stud. Fetainer. Lubricator. Side cover.
Ref.	23 8 2 2 3 8 2 3 8 4 4 4 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5
Description	Plug, 1". Crankcase with plugs, studs and camshaft bearings and cap. Side plate. Gasket. Front plate gasket. Idler gear shaft with Front plate. Idler gear with bushing. Thrust washer. Cap screw lock. Oil filler cap. Stud. Hex. nut, 3/8" N.C. Strainer.
Ref.	888 4888 88888888888888888888888888888
Description	Cylinder head stud, long. Short. Breather pipe. Faining indicator. Thaing mark cover. Dowel pin. Thaing mark cover. Dust seal gasket. Gasket. Gasket. Gasket. Oil level gauge sleeve. Washer. Oil filter return pipe. Drain cock.
Ref. No.	22 23 25 25 25 25 25 25 25 25 25 25 25 25 25

#### REPAIR SECTION

#### **ENGINE** - Continued

### Main Bearings (Steel Back Precision)

Number						7		
Material					Coppe	er I	ead	
Total Length,	Front			. 1-7/8	in.			
Total Length,	Intermediate (2, 3,	5, 6)		. 1-5/8	in.			
Total Length,	Center Thrust			. 3.118	in.	to	3.120	in.
Total Length,	Rear			.2-1/16	in.			
Running Clears	ance		•	003	in.	to	.004	in.
End Clearance				008	in.	to	.012	in.

When bearing clearance is excessive, replacement is necessary. The clearance may be checked with a pressure tank connected to the lubricating system, or by placing a .003-inch brass shim (1/4-inch by 1-1/4-inch long) lengthwise between the lower bearing and the crankshaft. The rate of the oil flow in the first method, and the drag on the crankshaft in the second method, indicates the amount of clearance.

Check the end play by driving a wooden wedge between the crankshaft and the rear of the crankcase, forcing the shaft to the front with the front crankshaft thrust surface tight against the front thrust flange of the center bearing. Remove the wedge and measure the thrust flange clearance on the upper and lower bearing flanges.

Each bearing can be replaced without removing the crankshaft. The oil pump must be removed when replacing the center main bearing. Tap the bearing cap lightly with the hammer to loosen and remove the cap from the studs. The lower bearing can then be removed from the cap. The upper bearing can be slid out of place by pushing on the end without the nib, using a thin piece of flexible metal while turning the crankshaft over with the hand crank in the direction of removal. The center main bearing has

flanged thrust surfaces. To take out the rear bearing, remove the small plate (26), Illust. 7, below the bearing. The cap and bore of the bearings are milled to receive the projection on the back of the bearing liner. The projection end is removed first.

When replacing, rotate the shaft so that the projection enters last. The bearing backs, crankcase bore, and cap bore should be absolutely clean and dry when replacing the shells. Put the bearing cap in place with the numbered side facing the numbered side or camshaft side of the crankcase. The main bearing numbers are stamped on the surface to which the oil pan attaches. The ends of the caps fit snugly into the crankcase. Engage one end first and tap the cap into place.

#### Crankcase Front Cover

When the engine is removed from the tractor, the crankcase front cover (36), Illust. 9, can be taken off. After taking out the crank pin (37) in the crankshaft, remove the nut and nut lock from the crankshaft, remove the fan belts, pull the fan drive pulley, remove the two keys from the crankshaft, and then the bolts from around the front cover.

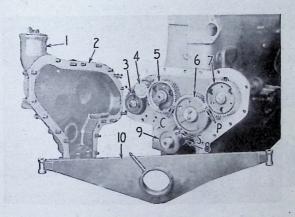
# Crankcase Front Cover - Continued

The crankshaft front oil seals (51) are located in the front cover. The cover is doweled to the front plate (28), of the engine. The front crankcase support (38) does not have to be removed before taking off the cover.

#### Timing Gears

The timing gear train is accessible

when the crankcase front cover is off. The timing gears are driven off the front end of the crankshaft and provide a positive and accurate drive to the camshaft, injection pump, and magneto. These gears must be in their proper place to have the engine timed correctly. The gears are punch-marked and stamped "C", "P", and "S" for proper timing. Replace the idler gear last. Have the other gears arranged to make the letters correspond as shown in Illust. 10.



Illust. 10 Timing Gears.

I. Front Cover; 2. Gasket; 3. Magneto Drive Gear; 4. Magneto Idler Gear; 5. Camshaft Gear; 6. Idler Gear; 7. Injection Pump Drive Gear; 8. Crankshaft Gear; 9. Crankshaft Oil Flinger; 10. Front Engine Support.

#### Idler Gear

The idler gear (29), Illust. 9, is held to the crankcase with a thrust washer (30), using two cap screws with lock (31). The idler gear slides off the idler gear shaft (27) which is held to the crankcase with a nut (40) and lock (41) fastening on the inside of the case. A pin in the idler shaft locates

the hole in the shaft with respect to the hole in the crankcase so that the bushing in the idler gear receives pressure lubrication.

#### Camshaft Removal

The camshaft removal is covered under the "Camshaft" in this section.

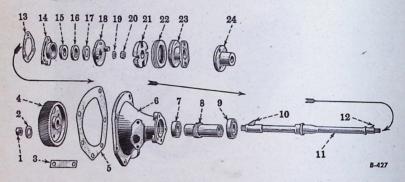
#### Injection Pump Drive

The injection pump drive gear assembly can be removed after taking off nut (1), Illust. 11, nut lock (3), and pulling the gear (4). This gear has tapped holes for a puller adapter.

With the injection pump removed, the remainder of the assembly can be lifted from the front plate after taking out the bolts in housing (6).

The shaft (11) can be removed from the housing after the cap screws from cap (14) are taken out. The cap will come out with the shaft. When the nut and washer are removed, the flange (18) can be pulled off the shaft (11).

The felt retainer (17), felt (16), and oil seal (15) can be removed from the cap (14). Be sure to use a new retainer, felt, and seal when replacing. Bearings (7) and (9), and the hour meter drive gear (8) can be removed from the housing (6). When replacing, put the bearing (9) in place first. Then the hour meter drive gear (8), and the bearing (7) go in the housing (6) from the front end.



Illust. II
Exploded View of the Injection Pump Drive.

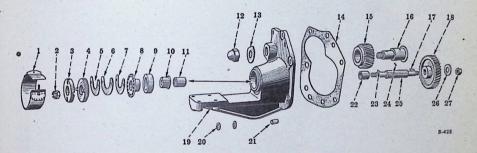
Ref.	Description	Ref.	Description
1 2 3 4 5 6 7 8 9 10 11 12 13	Nut, 3/4". Nut lock. Lock. Gear (54 teeth). Housing gasket. Housing with plug. Bearing. Hour meter drive gear. Bearing. Key (Woodruff #15). Shaft. Key (Woodruff #9). Gasket.	14 15 16 17 18 19 20 21 22 23 24	Cap, complete. Oil seal. Felt. Felt retainer. [Flange with pin. Dowel pin. Washer. Nut, 1/2" N.F. Spacer. Boot. Adjuster. Drive flange.

#### Magneto Drive

The magneto drive, Illust. 12, is driven from the camshaft gear. Dowel pins (21) in the bracket (19), locate the unit on the crankcase front plate. The magneto idler gear (15) can be removed after bending back the lock washer (13) and turning out nut (12). Push the shaft (16) out of the bracket (19) and lift off the idler gear. The pipe plug can be removed from the shaft (16) to clean the inside. The pin (24) holds the shaft in position so that the pressure lubricating oil holes line up.

The magneto drive shaft (25) can be removed from the bracket after removing the nut (27) and the lock washer (26) from the end of the shaft and pulling gear (18) from the shaft. Remove key (17) from the shaft and slide the shaft out. With the shaft out of the bracket, the oil seal (9) can be removed for replacement.

The diameter of the drive shaft (25) is .8720-inch to .8725-inch and the finished diameter of the bushings (22) and (11) is .874-inch to .875-inch. Two bushings are used. Replacement bushings must be pressed into place, flush with each end of the bracket, and then reamed to the sizes above. The bushing for the magneto idler gear (15) is not available separately; the inside diameter is 1.500-inch to 1.501-inch, and the shaft diameter for the idler gear is 1.4990 inch to 1.4985-inch.



Illust. 12 Exploded View of the Magneto Bracket and Drive.

Ref.	Description	Ref.	Description
1 2 3 4 5 6 7 8 9 10 11 12 13	Cover. Nut, 1/2" N.F. Spacer. Block (male). Shim (medium). Shim (heavy). Shim (light). Coupling. Oil seal. Spacer. Bushing. Nut. Washer. Gasket.	15 16 17 18 19 20 21 22 23 24 25 26 27	Gear, complete. Shaft, complete. Key. Gear. Bracket with dowels, bushings and pipe plugs. Gasket. Dowel. Bushing. Key. Pin. Shaft. Washer. Nut, 1/2" N.F.

# REPAIR SECTION

# MEMORANDA

#### ENGINE CLUTCH

Size
Manufacturer Rockford
Type Single plate, over-center
Torque capacity, ftlbs 1488
Throwout bearing, type Ball
Pilot bearing, type Ball

The hand-operated, over-center clutch with ball-bearing release has two rollers in each release cam to prevent wear and binding.

The release mechanism has a clutch brake which facilitates faster shifting of the transmission gears. No adjustment of this brake is necessary.

Pins on the release carrier (9), Illust. 1, have bushings (3) and (11) which fit into the release fork (10), reducing wear and friction to a minimum at this point. When replacing a release fork, be sure to engage the bushings in the fork and have the ridged end of the bushings on the inside.

The clutch can be removed through the top of the main frame without disturbing the engine or transmission. It is necessary to remove the clutch when the transmission has to be removed.

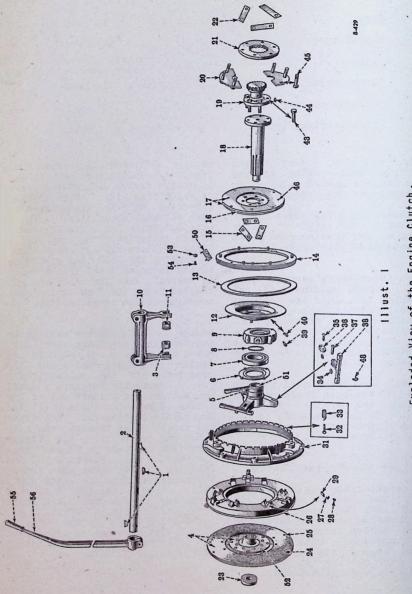
#### Removal of the Engine Clutch

Before removing the engine clutch, take off the bottom of the air cleaner, lock the steering brake pedals forward, and tie back the steering clutch levers for additional clearance. Take out the capscrews around the edge of the clutch cover and the two capscrews on each side under the fenders.

Engage the clutch and remove nuts from the coupling bolt (43), Illust.

1, on the clutch side of the brake friction disc (17). Turn the engine over with the hand crank to make all nuts accessible. Remove nuts and bolts (45) from the rear of the clutch coupling ring (21). These nuts are all made accessible by turning the coupling with the clutch disengaged and transmission in neutral. When the bolts are all removed from the front end of the coupling it can be lifted out.

Loosen one bolt in the hand lever and two in the release fork (10). Put a bar through the holes in the fender side sheet and drive the hand lever off the release shaft (2). Remove the key with a small punch. Drive the shaft out of the release fork until the keys (1) are accessible for removal. Then drive the shaft clear through the main frame and remove it. The release fork (10) can then be removed from the carrier (9). Bushings (3) and (11) can also be taken out. Remove the capscrews from the back plate (31). Then, with the help of a pinch bar, pry out the clutch shaft (18) sufficiently to clear the pilot bearing (23). The entire clutch unit can then be lifted out. The pilot bearing can be pulled out with a puller, SE-672.



Exploded View of the Engine Clutch.

Description	Rivet.	Plate assembly.	Cam block screw lock.	Screw, 1/4" - 20 x 1/2".	Cam block (set of six).	Back plate.	Bolt.	Spring.	Link nin long	Link.	Link nin. short.	Camshaft (set of three) 86 blocks	Lubricator fitting.	Dowel pin.	Coupling bolt.	Pilot lubricator.	Ring bolt.	Brake disc facing rivet.	Camshaft lubricator.	Adjusting lock.	Sleeve bushing.	Flat head rivet, 3/8 x 3/4".	Adjusting lock screw nut.	Adjusting lock screw.		
Ref.	25	56	27	88	59	31	325	200	35	36	37	38	29	40	43	44	45	46	48	20	21	225	52	54		
Description					Sleeve and bushing.	_	preeve and bearing assembly.	Plate.	Release bearing.	Ring.	Carrier.	FORK.	Fin bushing.	DISC.	king plate.	Adjusting ring.	Facing	Disc with facing on				Ring (18 teeth)			Facing package (two woven facings).	
Ref. No.	Н	1 50	0.	4 1	D C	10°	6	9	7	0	6	35	191	2 1 1	27	1 1 1	18	17	18	19	200	21	22	23	24	

# Disassembly and Repair of the Engine Clutch

Slide the driven member assembly (4) from the clutch shaft (18). If the facing (24) shows considerable wear, is rough, or oil soaked it should be replaced, providing, however, that the driven member plate (4) is is good condition. When installing new facing, be sure all rivets (25) are well countersumk. If the pressure plate assembly (26) is heat checked, scored, or warped, replace it with an entire new unit.

Remove the clutch shaft (18) and the disc (17). Then take off the adjusting ring lock (50). Unscrew the adjusting ring (14) and release the ring plate (13). Unscrew the bolts (32) and springs (33) to disengage the back plate (31) from the pressure plate assembly (26). If the pressure plate shows discoloration due to heat, it should be replaced.

Remove the cotter key, washers (34), the long link pin (35), the link (36), the short link pin (37), and the camshaft (38). If any of these show considerable wear they should be replaced.

Remove the capscrew in the disc (12) so the disc can be tapped off the carrier (9). Then remove the capscrews from plate (6) and pull the carrier (9) from the sleeve (5). Remove the snap ring (8) from the sleeve.

Pull the release bearing (7) and the plate (6) from the sleeve. The bushings (51) in the sleeve are replaceable; they are furnished to size and can be pressed into place. The shaft diameter is 1.997 inch to 1.999 inch. The running clearance between the shaft and bushing is .001 inch to .005 inch. Replace the bushings if the clearance is excessive. The ends of the bushings are flush with the ends of the sleeve.

# Reassembly of the Engine Clutch

Clean out all grease fittings in the drilled shaft before reassembling the clutch.

With the plate (6) assembled to the sleeve (5), press the bearing (7) onto the sleeve. Then replace the snap ring (8) on the sleeve. Drive the carrier (9) over the bearing (7). Replace the capscrews in plate (6) and carrier (9). Insert dowel pins (40) in the carrier and secure plate (12) to the carrier with the capscrews. Replace the link and pin assembly (34), (35), (36), and (37) between the camshaft (38) and the sleeve (5). Be sure the drilled oil hole in the camshaft is open.

Drop the camshaft (38) into the plate assembly (26) with the cam stops facing the back plate (31). With the ring plate (13) in position, and the adjusting ring (14) started, bring up the back plate (31) to the plate assembly (26).

Insert bolts (32), replace the springs (33), and the nuts and cotter keys. The nuts should be run down the same distance on each bolt. To facilitate final adjustment of the clutch, screw in the adjusting ring (14) until the distance from the face of the plate (26) to the face of the back plate (31) is  $31/32^n$ .

Assemble the disc (17) to the clutch shaft (18) and replace the shaft in the assembly. The driven member (4) can now be placed on the shaft (18). If the splines on either the shaft or the driven member are burred or damaged, causing the driven member to stick, the shaft should be replaced. The driven member should slide freely but without excess play on the shaft.

#### Reassembly of the Engine Clutch - Continued

Any parts that show discoloration due to excessive heat should be replaced. The face of the flywheel should be checked. If it is rough, it should be removed and smoothed. Use emery cloth or reface with a lathe.

### Replacement of the Engine Clutch

To replace the clutch in the tractor, drive the pilot bearing (23) into the flywheel first. Then lower the clutch into the main frame. Push the clutch shaft (18) into the pilot bearing. Line up the capscrew holes in the back plate (31) with those in the flywheel, and then run in the capscrews.

Set the clutch release fork (10) into position so that the bushings (3) and (11) at the bottom line up correctly with the pins of the carrier (9). Be sure the bushings are replaced with the flange facing the sleeve (5). Also be sure the lubricator fitting (39) is on the top side of the carrier.

Slide the release shaft (2) through the main frame bushing into the release fork (10). The keys (1) should be inserted in the shaft and the shaft driven into position in the fork. Turn the shaft around and continue driving until it emerges on the opposite side of the main frame.

Assemble the clutch hand lever to the end of shaft (2), replace the capscrew, and put the two capscrews in the release fork (10). Be sure the fork is centered over the carrier (9).

Push the clutch all the way forward to replace the coupling (19), with the teeth in the ring (21) engaging those on the coupling. Engage one of the bolts (43) in the clutch shaft to hold the coupling in place. Line up the holes in disc (17) and push in the rest of the bolts (43). Replace and tighten the nuts, and bend the locks. The coupling car be turned to make each one of thes accessible. Place one couplin washer (20) against the ring (21) and replace the ring bolts (45) and the bolt locks (22). Then do the same with the lower half of the washer. Pry the ring bolts into the flange, tighten them, and bend the locks.

Adjust the clutch according to instructions in the "Operations Section".

Replace the clutch cover, assemble the two capscrews on each side under the two fenders, and replace the bottom of the air cleaner.

# REPAIR SECTION

## MEMORANDA

#### FINAL DRIVE

#### Drive Bevel Gear

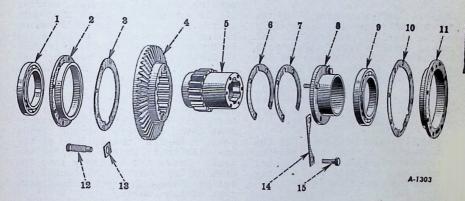
The drive bevel gear assembly is located in a separate compartment directly behind the transmission and between the two steering clutch compartments. The bevel gear and pinion are lubricated from the transmission compartment. Two leather oil seals prevent oil from

entering the steering clutch compartment.

Preparation for Removal of the Drive Bevel Gear

Remove the seat, batteries, and fuel tank.

Drain the oil from the transmission. Remove the main frame cover as



Illust. | Exploded View of the Drive Bevel Gear.

Ref.	Description
1 2 3 4 5 6 7 8 9 10 11 12 14 15	Bearing. Cage, left hand. Gasket. Bevel pinion and shaft with drive bevel gea Hub. Shim, heavy. Shim, light. Spacer. Bearing. Gasket. Cage, right hand. Set screw. Screw lock. Lock. Bolt.

#### Preparation for Removal of the Drive Bevel Gear - Continued

described under "Preparation for Removal of the Transmission" in Section 13.

Remove the steering clutches as described under "Steering Clutches" in Section 11.

#### Removal of the Drive Bevel Gear

Assemble puller capscrews to the tapped holes in the right-hand bearing cage (11), Illust. 1. Run them up evenly and remove the cage and gasket (10). Loosen the set screw (12) in the left steering clutch compartment. Bend back bolt locks. (14) and remove the bolts (15) in the spacer (8) and the gear (4). Pry the gear and spacer apart and remove shims (6) and (7).

Assemble puller capscrews to the tapped holes in the left bearing cage (2), run them up evenly, and remove the cage with the bearing (1), and the gasket (3).

Drive the hub (5) to the right, out of the ring gear, forcing the spacer (8) and the bearing (9) with it. The bearing can be pulled from the hub (5), and the spacer (8) slid off. The gear (4) can be lifted from the compartment.

## Repair of the Drive Bevel Gear

If the bevel gear is to be replaced with a new one, the bevel pinion should also be replaced at the same time. These parts are furnished in matched pairs.

#### Replacement of the Drive Bevel Gear

Clean the compartment before replacing the assembly. Clean it again after the assembly is completed. Assemble the left-hand bearing (1) to the bearing cage (2). The outer race of bearings (1) and (9) are narrower than the inner race. The races of the bearings are flush on one side. Assemble the bearings to the bearing cages so that the flush side is always to the left, or so that the projection side of the inner race is toward the right side.

With gasket (3) secured to the bearing cage (2) in which bearing (1) is assembled, place the unit in the left bore from the steering clutch compartment. Assemble the left bearing cage cap (4), Illust. 1, Section 11, to the bearing cage (2), Illust. 1, and bolt the cap and the cage to the main frame.

Place the bevel gear (4) in the compartment. Insert hub (5) through the right steering clutch compartment into the bore of the bevel gear. Engage the spline of the hub with that in the bore of the gear. Drive the assembly into the bore of the bearing (2) until the spline of the hub strikes the inner race of the bearing.

Place the same number of shims as removed against the bevel gear and slide the spacer (8) into position against the spline of hub (5). Start the bolts (15) with locks (14) in the spacer and gear.

Assemble the right-hand bearing (9) to the bearing cage (11), with the flush side of the bearing to the left and the projection of the immer race to the right. Attach gasket (10), to the bearing cage and push it in place over the hub.

Remove the left-hand bearing cage cap.

Assemble the steering clutch shaft coupling to the left and right ends of hub (5).

# Replacement of the Drive Bevel Gear - Continued

Assemble the bearing cage caps (4), Illust. 1, Section 11, to the bearing cages (2) and (11), Illust. 1, and draw all bolts tight.

Now draw all bolts (15) tight, revolving the gear with the transmission in neutral to make each one accessible.

#### Adjustment of the Drive Bevel Gear

Check the backlash of the gears. This can be done by wedging the transmission gears and rocking the bevel gear back and forth. A dial indicator touching the face of one of the teeth in the ring gear will give the exact backlash, which should be .014 in. To increase the backlash to this amount, remove bolts (15) and add shims between the spacer (8) and the gear (4).

If a new bevel gear and pinion have been installed, the pinion must be adjusted for the proper cone setting of the pinion teeth with those of the gear. This is done before replacing the transmission and main frame cover. Do not draw up the bolts tight in the spacer and gear and omit the instructions in the preceding paragraph.

Place a .625" gauge between the toe end of the pinion and the machined diameter of the bevel gear's hub (5). Drive the bevel pinion shaft to the rear so that this gauge can be held in place. This gauge may be made from 5/8" key stock, 5/8" drill rod, or any narrow object 6" long, measuring .625" in diameter. Since there are slight variations in key stock and drill rod, select a piece exactly to size. With the pinion held firmly against the gauge and gear hub, insert the proper number of shims at the pinion shaft front bearing cage to establish the cor-

rect position of the pinion with the .625" gage in place. If, when turning the bevel gear over, a slight runout on the gear hub or spacer is noted, set the gauge between the tightest and lowest points.

Now adjust the shims between the bevel gear and spacer to obtain the backlash specified above.

As an extra check, apply red lead or Prussian blue to the teeth of the pinion. Powdered red lead mixed with a small amount of oil can be formed into a cake and applied to the pinion teeth with a stencil brush. Revolve the gears in the forward direction, using the pinion to drive the gear. Inspect the teeth of the pinion where the paint has been removed. The tooth bearing resulting will be on the toe end of the teeth and should be centered up and down on the active portion of the tooth profile. If the profile bearing is high, use less shims at the front end of the pinion shaft. If the profile is low, use more shims. Recheck the backlash when shims are added or subtracted from the pinion shaft.

Set the bevel gear deflection set screw (12) to .020" clearance between the end of the screw and the back side of the bevel gear. Bend back the lock (13) after making the adjustment.

The bearing cage caps (4) and the clutch couplings (1), Illust. 1, Section 11, can now be removed so that the steering clutches can be assembled.

Assemble the steering clutches, transmission, and main frame cover, and other items removed. Be sure to refill the transmission case with the proper grade of lubricant.

## REPAIR SECTION

#### FINAL DRIVE - Continued

## Sprockets and Sprocket Drive

The power is transmitted from the drive bevel gear through the steering clutches to the sprocket drive gears and sprockets which are ballbearing mounted on the stationary pivot shaft. These bearings are sealed with labyrinth bracket seals in two self-adjusting, floating-diaphragm type seals. Each sprocket is reversible. It can be removed from its hub, reversed, and placed back on the same side of the tractor, thereby utilizing both sides of the teeth.

# Removal of the Sprockets and Sprocket Drive

Lock the steering brakes and support the steering clutches when removing the sprocket drive parts. Take off the track chain as outlined in Section 12. Then remove the capscrews from the stabilizer roller guide. The track frame is freed at the front by putting a jack under the front stabilizer, and raising it sufficiently to take the load off the equalizer spring. Remove capscrews from the diagonal brace bearings at the pivot shaft.

Lift off the sprocket shield (57), Illust. 2, after the capscrews in the bracket (51) and bolts in the track frame have been removed. The track pivot cap (55) and gasket (54) come off after removing four capscrews.

Remove capscrews from the pivot bearing (53) and the pivot bracket (51). Jack up the rear of the tractor on the side being worked on. Slide off the pivot bearing (53) with the bracket (51), and items (48), (49), (50), (65), (66), and (67). The packing (64) may be lifted from the dirt deflector (63).

Remove the capscrews which hold the dirt deflector (63) to the bearing cage (59). Lift off the dirt deflector (63), the retainer (62) and gasket (61). Assemble puller capscrews to the bearing cage (59). Run up capscrews evenly and pull the bearing cage (59) with bearing (60) and gasket (47). Bend back nut lock (45) and unscrew the nut (46). The service tool SE-1184-2 fits the nut (46). The sprocket (44) with its carrier (31) and dirt deflector (30) can be pried from the splined hub of the gear (20). The sprocket (44) may be removed from the carrier (31) and reversed for getting double the wear from the sprocket.

If the gear cover (23) or the carrier (34) are to be removed, a different procedure is necessary for both regular and wide-tread tractors. Refer to the heading concerning the tractor on which you are working.

#### Wide Tread Tractors

Lift out the packing (29) and remove capscrews in the dirt deflector (27). This will allow the retainer (25), diaphragm (26), dirt deflector (27), pressure plate (28), and springs (42) to be removed as a unit. Remove capscrews in the cap (17) and lift it off. Remove capscrews, bolts and nuts around gear cover (23) and turn puller capscrews into the tapped holes provided. Pull the gear cover (23) with gasket (22) and dowels (24). Bearing (15) will come off with cover (23) as will possibly the pinion (12). If not, the pinion (12), with bearing (11), can be pried from the carrier (34). The gear (20) can now be pried from the pivot shaft (52) with bearing (37) and spacer (21). The spacer (36) may now be slid from the pivot shaft.

#### Wide Tread Tractors - Continued

To remove the carrier, it will be necessary to take off the inspection covers on top of the main frame cover near the steering clutch release fork, and support the steering clutches with a rope attached to a chain hoist. Remove the lock bolts (7) from the bearing nut (6), and turn the nut off pinion shaft (1). Remove nuts and bolts from the carrier (34). Assemble puller capscrews, run them up evenly, and pull the carrier from the main frame with bearing retainer (2), gasket (3), oil seal (4) with bearing (5), and dowel pins (18). The ring (32) fitting in the groove in the main frame around the pivot shaft (52) can now be removed.

#### Regular Tread Tractors

Lift out the packing (29) and remove capscrews in the dust deflector (27). This will allow the retainer (25), diaphragm (26), dust deflector (27), pressure plate (28) and springs (42) to be removed as a unit. Remove capscrews from cap (17) and lift it off. Remove capscrews and lift off the pinion bearing retainer. Remove capscrews, bolts and nuts around the gear cover (23) and turn puller capscrews into the tapped holes provided. Pull the gear cover (23) with gasket (22) and dowels (24). Bearing (15) will come out with cover (23) as will possibly the pinion (12). If not, the pinion (12) with bearing (11) can be pried from the carrier (34). The gear (20) can now be pried from the

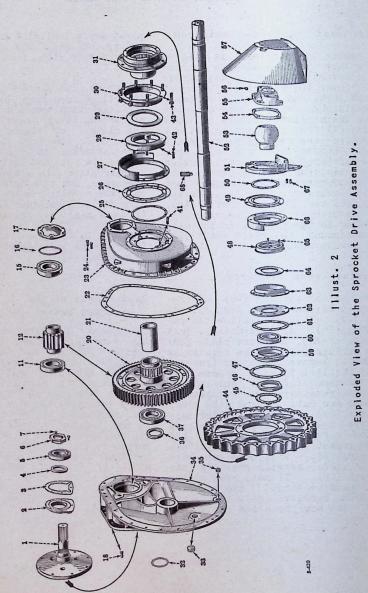
pivot shaft (52) with bearing (37) and spacer (21). The short spacer (36) may be slid from the pivot shaft.

To remove the carrier plate (34), it will be necessary to take off the inspection covers on top of the main frame cover, near the steering clutch of release fork, and support the steering clutch with a rope attached to a chain hoist. Remove the nuts and bolts from the carrier plate (34), assemble puller capscrews, run them up evenly, and pull the carrier from the main frame with oil seal retainer (2), gasket (3), oil seal (4), bearing (5) and dowel pins (18). The ring (32) fitting in the groove in the main frame around pivot shaft (52) car be removed.

# Replacement of the Sprocket Drives

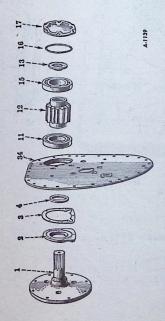
To replace the sprocket drives, the removal procedure can be reversed. The oil seal (4) should be placed in the oil seal cage so that the lip of the seal will face the pinion (12). When pressing the bearing cage (59) with the bearing (60) into the carrier (51), be sure to line up the capscrew holes in the bearing cage with those in the carrier. When replacing diaphragm seals, test the action of the seals first. Be sure the anchor pins (41) enter the holes in the pressure plate (28), and also be sure that the anchor pins (67) in the bracket (51) fit into pressure plate (48).

Sprocket Drive Assembly



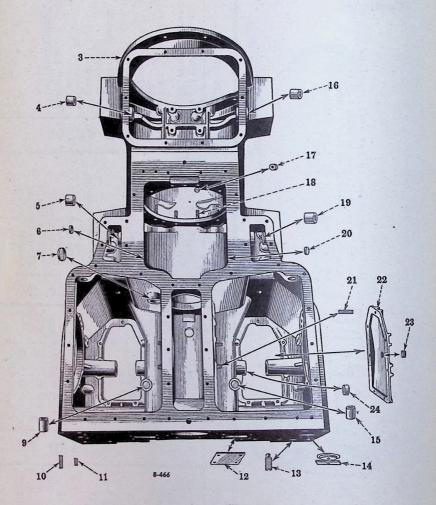
# Sprocket Drive Assembly - Continued

ne illustration to the left, applies of the regular tread tractors only. It is with similar numbers shown above, well as Items 5, 6, 7 and 18, apply ily to wide tread tractors.



-		The second second					
Ref.	Description	Ref.	Description	Ref.	Description	Ref.	Description
100 00 400 00 10 10 10 10 10 10 10 10 10 10 10 1	Pinion shaft. Bearing retainer With oil seal. Bearing retainer oil seal. Bearing. Bearing nut. Lock bolt. Bearing. Sprocket drive pinion (12 teeth). Washer (not il- lustrated). Bearing. The packing ring. Cap with packing	08 1888 4888 8888 888 888 888 888 888 888	Gear (68 teeth) and carrier. Spacer, long. Gasket, Cover with anchor pins. Dowel pin. Retainer. Diaphragm. Guard. Pressure plate. Packing. Deflector. Garrier. Ring (track frame pivot shaft). Ring (track frame pivot shaft). Carrier with plug, 1-1/2". Carrier with plug, 1-1/2".	8564444 444444888 88 8671884 887880018 84	Spacer, short. Bearing. Anchor pin. Spring. Bolt. Sprocket (29 teeth). Lock. Nut. Gasket. Bracket anse. Bracket frame prock frame	00 0000 00000 00000 00000 00000 000000 0000	Cap (track pivot). Lubricator (track pivot). Shield (sprocket). Cage. Bearing. Gasket. Retainer. Deflector (track frame). Packing. Spring. Guard. Anchor pin. Pivot shaft set
	The second name of the second na					-	

## FRAME



Illust, I Exploded View of the Main Frame,

See opposite page for descriptions.

#### Main Frame

A heavy, reinforced casting houses the engine clutch, transmission, bevel gear and pinion, steering clutches, and steering brakes. Heavy channels of steel are securely bolted to the main frame casting and tied in front by the heavy radiator base. This rugged foundation absorbs stresses and strains.

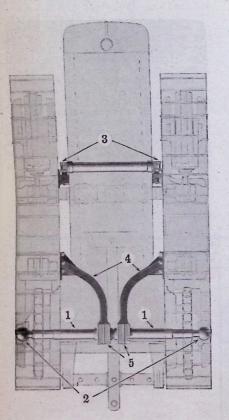
#### Track Frame

The front idler, track idlers, and track rollers are secured to the heavy, welded-steel, channel-constructed track frames. They are pivoted by a ball and socket on

the ends of the pivot shaft. Each track is free to oscillate vertically independent of one another. This prevents leverage strains being imposed on the pivot shaft (1), Illust. 2, due to the slight lateral deflection of the track frame. The equalizer spring contacts the track frame, and the roller-type stabilizers (3) maintain the track spacing (heavy braces and brackets attach to the main frame side channels and carry the stabilizer rollers; roller guides are bolted to the track frame assembly). Heavy steel diagonal braces (4) are bearing-mounted at the center of the pivot shaft. They keep the track frame in upright position but allow vertical oscillation.

#### See Illustration on opposite page.

Ref.	Description	Ref.	Description
3	Main frame.	15	Steering clutch release
4	Engine clutch release shaft bushing.	16	shaft bushing. Engine clutch release
5	Steering brake lever outer bushing.	17	shaft bushing. Socket head pipe plug,
6	Steering brake operating	18	1-1/2 inch. Transmission end cover stud.
7	shaft plug. Reverse idler shaft plug.	19	Steering brake lever outer bushing.
9	Steering clutch release shaft bushing.	20	Steering brake operating
10	Drawbar guide bracket stud, upper.	21	Shaft plug. Bevel gear bearing cage
11	Drawbar guide bracket stud,	22	stud. Steering brake inspection
12	Main frame rear inspection	23	cover. Drain plug.
13	Cover. Track frame pivot shaft	24	Brake pivot shaft cup
14	set screw. Steering clutch lubricating port cover.		plug.



Illust, 2
Track Stabilizer Construction,

I. Track Frame Pivot; 2. Balland-Socket Pivot Bearings; 3. Front Stabilizer; 4. Diagonal Braces; 5. Diagonal Brace Pivot Bearings.

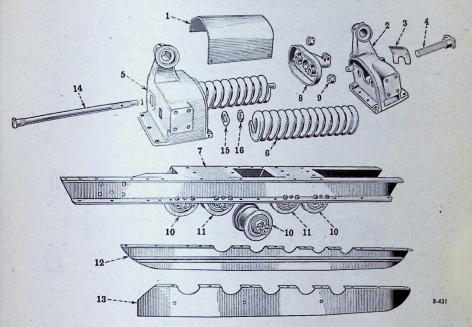
#### Removal of the Track Frame

Take off the track chain, place a jack under the stabilizer brace, and raise the front of the tractor enough to take the load of the equalizer spring from the track frame. Take out the bolts in the roller guide. Put a jack under the drawbar. Then disconnect the diagonal brace at the pivot shaft. Take out the bolts in the sprocket shield and pivot bearing bracket. The frame can then be slid out of place.

## Disassembly of the Track Frame

\*Remove the guard (1), Illust. 3. The outer (12) and inner (13) track shields can be taken off after the bolts have been removed from the frame (7). To release the track rollers (10) and (11), remove the bolts from the roller brackets. Jack up the nearest end of the track frame and lift the rollers out.

Then remove the capscrews from the cover plate (3) and remove the plate. After loosening the lock bolt in front of the spring retainer (8), unscrew the idler adjuster (4).



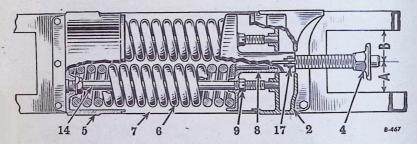
Illust. 3
Exploded View of the Track Frame with Recoil Spring.

Ref.	Description	Ref.	Description
1 2 3 4 5 6 7 8 9 10	Guard.  Spring guide, left hand. Spring guide, right hand. Cover plate. Idler adjuster.  Retainer, rear, left hand. Retainer, rear, right hand. Spring.  Frame, complete, left hand. Frame, complete, right hand. Retainer, front. Nut, 3/4 inch N.F. Track roller, complete (Nos. 1, 3 and 5).	11 12 13 14 15	Track roller, complete (Nos. 2 and 4).  Shield, outer, left hand. Shield, inner, left hand. Shield, inner, right hand. Shield, inner, right hand. Spring adjusting rod. Spring adjusting rod lockwasher. Spring adjusting rod lock nut.

# Disassembly of the Track Frame - Continued

Remove the bolts from the spring guide (2) and the frame (7). The spring guide and the top idler can be slid forward and removed. Compression in the springs (6) can be relieved by unscrewing nut (9) after taking out the cotter keys.

Unscrew each nut the same amount to relieve compression evenly. The springs (6) can then be pulled off the spring adjusting rod (14). Then remove capscrews from the retainer (5) and lift it off the frame (7). After bending back the lockwasher (15) for the spring adjusting rod (14), and removing the lock nut (16), the spring adjusting rod can be slid out.



Illust. 4 Cross Section of the Track Front Idler Recoil Spring Assembly.

2. Recoil Spring Guide; 4. Idler Adjuster Rod; 5. Rear Spring Retainer; 6. Recoil Spring; 7. Track Frame; 8. Front Spring Retainer; 9. Castellated Nut; 14. Spring Adjusting Rod; 17. Adjuster Rod Lock Bolt.

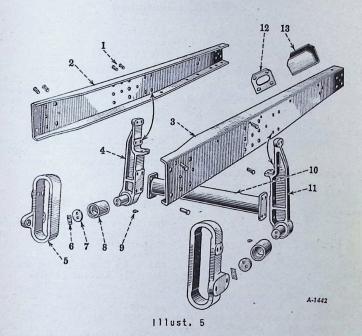
#### Reassembly of the Track Frame

Place the rear retainer (5) on the frame (7) and run in the capscrews. Insert the spring adjusting rod (14) in the retainer (5). Place the lockwasher on it and run up the lock nut (16). Then bend back the lockwasher.

Slide the compression springs (6) over the spring adjusting rod. Bring the front retainer (8) into position on the adjusting rod (14), and run up nuts (9) until cotter keys can be placed through them and also through the adjusting rod. The nuts must be run up evenly to compress the springs (6) without danger of cocking the retainer (8)

on the rods (14). The end of the retainer (8) should be centered between the panels of the track frame (7). (See A and B of Illust. 4.)

Place the spring guide (2) on the frame so that the adjusting rods (14) enter the two holes in the guides. Run in the idler adjuster (4). After final adjustment, the lock bolt (17) in the front retainer (8) should be tightened. Adjust nuts (9) to make the idler adjuster (4) parallel with the frame (7). It should not be cocked to the side because this causes the tractor to creep to one side and increases track wear. Bend the cotter keys in nuts (9) and replace the cover plate (3).



Exploded View of the Track Frame Guide.

Ref.	Description	Ref.	Description
1 2 3 4 5 6 7	Dowel. Channel, left hand. Channel, right hand. Bracket, complete, left hand. Guide. Capscrew lock. Washer.	8 9 10 11 12 13	Roller. Lubricator. Bracket brace. Bracket, complete, right hand. Starting crank support plate. Starting crank support clamp

# Reassembly of the Track Frame - Continued

Replace the five track rollers (10) and (11). Assemble the guard (1) to the spring guide (2) and the retainer (5). Then shields (12) and (13) can be secured to the frame.

### Replacement on the Tractor

The track frame assembly is replaced on the tractor in the reverse order of removal.

#### Track Frame Pivot

A heavy pivot shaft (52), Illust.
2, Section 5, extends through the rear of the tractor from track to track. The driving sprockets (44) revolve around this stationary axle. The track frames are mounted on this same axle through a ball and socket joint (51), (53), and (54), thus eliminating any twist or leverage loads at this point. Heavy steel diagonal braces bolted to the track frames are pivoted at midpoint of this shaft.

The pivot shaft needs replacement only in case of breakage. To remove the pivot shaft, it is advisable to pull the pin from the front end of the drawbar, and remove the capscrews from each diagonal brace at the pivot shaft. Jack up the tractor at the rearend, remove the sprocket drive gears and housing down to the main frame. Remove the

diagonal brace bearings from the pivot shaft. Remove the drawbar braces. Remove the pivot shaft set screw (68), and scrape the paint away from the pivot shaft at the center.

When replacing the pivot shaft, be sure to install new rubber rings between the main frame and the carrier casting.

#### Track Frame Guide

The track frame guides which maintain the track spacing consist of rollers (8), Illust. 5, attached to brackets (4) and (11) bolted to the main frame side channels (2) and (3), and the guides (5) attached to the recoil spring guides (2), Illust. 3. The bracket brace (10), Illust. 5, maintains the roller spacing.

To remove the track frame guide assembly, jack up the front of the tractor at the radiator. Then remove the bolts in the bracket brace (10), the brackets (4) and (11), and the guides (5). Lift off the guides and drive the brackets off the dowel pins (1).

The rollers can be removed from the brackets by bending the capscrew lock (6), taking out the capscrews, and sliding off washers (7) and rollers (8).

Replacement of the guides is the reverse of removal.

### Track Frame Diagonal Brace

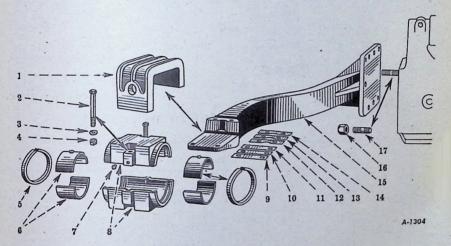
The diagonal brace (15), Illust. 6, keeps the tracks in vertical alignment and extends from a fixed position on the track frame to a pivot bearing on the pivot shaft at the center of the tractor.

This unit can be disassembled by removing nuts (16) from the studs (17) in the track frame. After removing clamp (1), the brace (15) can be let down. When nut (4) is taken off, bolts (2) can be pulled out and the bearing (8) slipped off.

Felts (5) can be pulled out. Use new, oil-soaked felts for replacement.

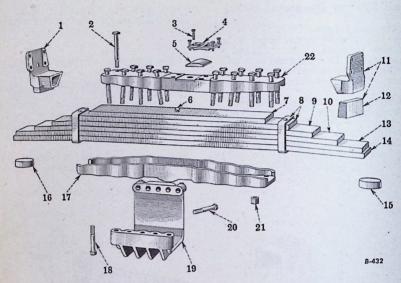
If the bushings (6) are only slightly worn, play can be removed by displacing the proper shims (9) to (12), (10) to (13), or (11) or (14). If replacement is desired, the bushings can be removed with a screwdriver. They are replaceable, furnished to size.

Reassembly of the diagonal brace is the reverse of disassembly.



Illust. 6
Exploded View of the Diagonal Brace,

Ref.	Description .	Ref.	Description
123456789	Clamp. Bolt, 1/2 x 4 inch N.F. Lock washer, 1/2" (Shakeproof). Nut, 1/2 inch N.F. Felt. Bushing (set of 4). Lubricator. Bearing. Shim, outer (extra heavy).	10 11 12 13 14 15 16 17	Shim, outer (heavy). Shim, outer (medium). Shim, inner (extra heavy). Shim, inner (heavy). Shim, inner (medium). Brace, left hand. Brace, right hand. Nut. Stud.



Illust. 7 Exploded View of the Equalizer Spring.

Ref.	Description	Ref.	Description
1 2 3 4 5 6 7 8 9 10 11	Bumper pad bracket with pad, right hand. Saddle bolt. Dowel bolt, upper. Pad, upper. Wearing pad. Center bolt and nut. No. 6 leaf. No. 5 leaf with clip. No. 4 leaf. No. 3 leaf. Bumper pad bracket with pad, left hand.	12 13 14 15 16 17 18 19 20 21 22	Bumper pad. No. 2 leaf. No. 1 leaf. Guide pad. Guide pad. Saddle, lower. Dowel bolt. Frame pad, lower. Dowel bolt nut. Saddle bolt nut. Saddle with wearing pad, upper.

## Equalizer Spring

The equalizer spring is removed from the tractor by jacking up the front end of the tractor, removing the track frame from one side of the tractor, and running out the dowel bolts (18) and (£0), Illust. 7. Be careful to support the spring in doing so because the lower frame pad (19) is now free along with the entire equalizer spring assembly.

The entire assembly can now be removed from the tractor.

# Disassembly of the Equalizer Spring

Remove the bolts (2) from the upper (22) and lower (17) saddles. If necessary, the wearing pad (5) can be disengaged from the upper saddle (22) by removing the rivets in the pad.

#### FRAME - Continued

# Disassembly of the Equalizer Spring - Continued

The top leaf (7) can be lifted off when the center bolt (6) is taken out.

If it is necessary to replace damaged springs, remove clips on both ends of No. 5 leaf (8), thus freeing the leaves (8), (9), (10), (13) and (14).

# Reassembly of the Equalizer Spring

Reassembly is the reverse of disassembly. To facilitate reassembly, however, assemble all the leaves. Then replace the center bolt (6) to align the leaves. The upper pad (4) is attached to the bottom of the main frame with the special dowel bolts (3).

# Rigid Track Frame

(Used in place of Equalizer Spring, etc., when the TracTracTor is equipped with Cranes, Pipe Booms, and similar superimposed Equipment.)

The rigid track frame is a term used to specify the action of the

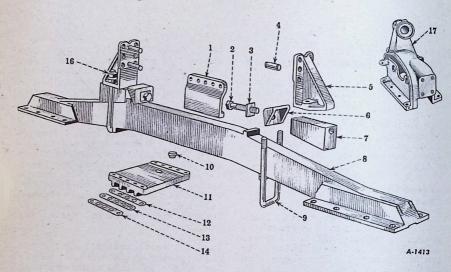
track frame when the equalizer spring is replaced with a rigid cross bar. The removal procedure for this type of unit is similar to the removal of the equalizer spring.

Jack up the tractor at the front just enough to relieve the cross bar of the engine weight. Remove the track chain on both sides. Remove the front idlers and turn out the front idler adjusters (4), Illust. 3. Take off the recoil spring guards (1). Take out the bolts in the rear spring retainer (5) and withdraw the spring retainer with the recoil spring assembly.

Take out bolts and lift off the recoil spring guides (2). Remove the bolts holding clamp support (1), Illust, 8, and clamp (11) to the main frame. Remove the nuts from the "U" bolts (9). Jack up the front end some more so that the wedge clamps (6) clear the lugs on the cross bar. Pull the cross bar (8) out the front. The brackets (5) are doweled (4) to the main frame side channels.

Replacement of the rigid frame cross bar is reverse of the removal procedure.

# FRAME - Continued



Illust. 8

Exploded View of the Rigid Track Frame Crossbar.

Ref.	Description	Ref.	Description
123456789	Cross bar clamp support. Cross bar wedge bolt. Cross bar wedge bolt lock. Cross bar bracket dowel. (Cross bar bracket, left hand. (Cross bar bracket, right hand. Cross bar wedge clamp. Cross bar wedge. Cross bar. Bar bracket "U" bolt.	10 11 12 13 14 16	Cross bar dowel. Cross bar clamp. Cross bar clamp shim, medium. Cross bar clamp shim, heavy. Cross bar clamp shim, extra heavy. Cross bar bracket "U" bolt nut. Track idler support, front.

#### FUEL SYSTEM

# Injection Nozzles

The injection nozzle assembly consists principally of the nozzle, the nozzle body retainer, and the spacer or precombustion chamber. There are three copper gaskets in-side the nozzle body. The first is below the nozzle plate, the second is between the spacer and the valve-and-valve-spring assembly, and the third is between the spacer and the nozzle fitting (Illusts. 1 and 2). Use new gaskets if possible whenever servicing nozzle parts. Another copper gasket is located between the nozzle body and the retainer. Steel gaskets are located above and below the spacer.

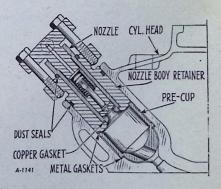
--- Nozzle fitting --- Gasket -- Spacer - Gasket --- Valve and spring assembly O←--- Plate ←--- Gasket -- Nozzle body \_ Gasket Nozzle body retainer --- Retainer dust seal - Gasket Gasket A-465

Illust. I Exploded View of an Injection Nozzle. Cross Section of an Injection Nozzle.

NOTE: When replacing the nozzle body spacer be sure it is assembled with the word "UP" toward the top of the cylinder head.

The injection nozzles have a counterbore and a groove in the nozzle body retainers to accommodate dust seals. When assembling these seals, apply a light coating of potash soap solution to the seal. it onto the nozzle body retainer and insert the assembly into the cylinder head bore. Tighten the nuts holding the nozzle body retainer to the cylinder head to 45 ft.-lbs. torque.

The injection nozzles can be readily removed by taking out two capscrews and disconnecting the fuel injection pump tubing. The assembly should be clean and free of carbon. To clean the nozzle, un-screw the nozzle fitting from the nozzle body. Check the length of the nozzle valve spring as it is assembled before dismantling. will make reassembly to the proper tension much easier. The correct pressure of the assembled springs should be 34 to 35 lbs.



# Injection Nozzles - Continued

The nozzle should be checked with the hydraulic test pump SE-905-A for correct opening pressure as follows:

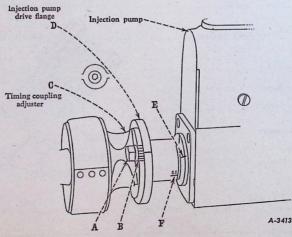
The leakage past the valve at 700 lbs. per sq. in. pressure should not exceed five drops per minute. The valve should be set to open at 700 lbs. per sq. in. pressure. Readjust the spring if necessary. Before testing the nozzle draw down the nozzle fitting to the nozzle body with a torque wrench to 90 ft. lbs. torque. Capscrews holding the nozzle body and fitting in the nozzle body retainer should be drawn down to 20 ft. lbs. torque.

If a smoky exhaust condition exists in one cylinder it can be traced by opening successively the fuel bleeder screw in each nozzle. The clearing of smoke on opening any one bleeder screw indicates a leaky injector valve in that nozzle. This is particularly true of a light exhaust condition. Dirty nozzles and poor fuel will cause a light or dark blue smoke. The leaky nozzle valve, improper timing of the injector, poor fuel, and insufficient

air are several of the causes for a heavy brown or black exhaust smoke. A knocking condition confined to one cylinder very often is caused by a leaky nozzle valve, a dirty fuel pump delivery valve, a broken delivery valve spring, sticky or warped intake or exhaust valves, and a leaky cylinder head Water in the fuel, sticky gasket. nozzle valves, or poor fuel will result in a general knocking condition of erratic or intermittent nature.

# Fuel Injection Pump

The primary unit of the Diesel fuel injection system is a Bosch flangemounted injection pump. It is a constant stroke, cam-actuated solid injection type equipped with a variable stroke, self-regulating, plunger-type fuel supply pump. Fuel from the supply tank is pumped through an absorption-type metal and cloth element fuel filter. The injection pump operates at 1/2 engine speed. Air in the fuel system may be bled at the sediment bowl; fuel filters, and injection nozzles as described in the "Operations Section".



[] Ilust. 3
Injection Pump Coupling Showing Timing.

# Fuel Injection Pump - Continued

The injection pump drive has a timing adjustment between the drive flange and the coupling. This is normally set with capscrew "A", Illust. 3, at center of slot "B", and the mark on the drive flange "D" is at the center mark of the graduations on the coupling adjuster "C". Since operating conditions vary, the position of the mark on flange "D" can be tried on either side of the center mark on the coupling adjuster "C".

Loosen the capscrew "A" and set to a position where the engine speed is maximum for a fixed load and the engine runs smoothly with the cleanest exhaust.

The timing coupling is made so that it can be assembled only one way for correct timing of the pump with relation to the crankshaft. The injection pump is timed for port closing of No. 1 cylinder. Set the engine on the gasoline cycle and crank the engine by hand so No. 1 piston approaches top dead center on the compression stroke. Stop cranking when the "SI" mark (meaning start of injection) on the flywheel registers with the timing pointer on the right side of the rear engine support. Turn the pump flange "D" so that the "SI" mark on the pump flange registers with mark "E" on the face of the pump. The "SI" mark is approximately 45° from the vertical.

Whenever the high-pressure tubing is to be disconnected from the fuel injection pump, use two wrenchesone to loosen the pipe fitting and the other to prevent possible turning of the discharge fitting on the pump. Whenever the tubing has been removed place caps over the discharge fittings to prevent the possible entrance of dirt.

### Removal of the Fuel Injection Pump

Pry the leather boot (22) Illust. 11, Section 3, from the adjuster (23). Remove high-pressure tubing

from the nozzles and injection pump, and place dust caps on the discharge fittings and nozzle fittings. Remove copper tubing from the supply pump and inlet and outlet fittings on the pump. Take the governor control rod from the control lever of the injection pump. Take out four capscrews holding the pump mounting bracket to the engine crankcase, and lift the pump back and up to remove.

# Replacement of the Fuel Injection Pump

If a replacement pump does not have drive flange (24) already attached, mount the flange from the pump removed on the new pump. Similarly, attach adjuster (23) to the flange (24). Attach the overflow pipe to the pump and attach the mounting bracket to the base of the replacement pump. Turn the engine over to the compression stroke for No. 1 cylinder and continue turning until the "SI" mark on the flywheel registers with the opening in the flywheel housing. Turn the pump over so the "SI" mark on the flange (24) registers with the "SI" mark on the flange (24) registers with the "SI" mark on the front cover of the injection pump. The "SI" mark on the pump is located approximately 45° from the vertical.

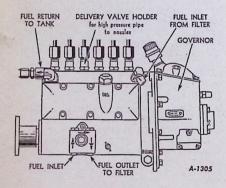
Lift the pump into place, enter the overflow pipe into its clip and the prongs on the adjuster into spacer (21). Attach the mounting bracket to the crankcase, and replace fuel lines, high-pressure tubing, and the governor control rod.

Time the pump as outlined in the "Operations Section". See steps 13 to 15 inclusive, "Adjusting Starting Control Mechanism", Section 10. If the engine does not come up to the proper high idle speed, remove the small cover adjacent to the governor control lever on the pump and adjust the rear set screw to give the speed desired. If the pump 'does not shut off by closing the throttle, adjust the front set screw to make it do so. Replace the cover and seal.

# Basic Tests and Adjustments of the Bosch Fuel Injection Pump

Fuel injection pumps removed from an engine, as well as those reassembled after servicing, should be operated on a test bench such as the IHC SE-1247 test bench. Fundamentally, such a bench is a means of running the pump at normal operating speeds - with the tractor fuel piping duplicated and graduated containers to catch the fuel delivered from the injection nozzles.

The start of injection for each plunger, the pressure maintained by the fuel supply pump (6 to 8 lbs.), and the quantity of fuel delivered to each cylinder of the engine can be checked. Necessary adjustments can be made and the pump replaced on an engine with a minimum of lost time. Many pumps removed from



Illust. 4 Bosch Fuel Injection Pump.

engines require only retiming and recalibration.

The test stand should be equipped to drive the injection pump at a speed of 550 R.P.M., and preferably another speed equivalent to the

full load speed of the engine (1200 R.P.M. engine speed; 600 R.P.M. pump speed). In addition, the drive should include a disc graduated in degrees of a circle, and an adjustable pointer. A gage rod graduated in millimeters or 64ths, attachable to the rear of the injection pump housing, and a pointer to match, attachable to the rear end of the control rod should be provided.

# Timing the Bosch Fuel Injection Pump

For timing, attach the injection pump to a suitable bracket aligned Thoroughly clean with the drive. the exterior of the pump and remove the governor assembly as outlined "Repair of the Bosch Fuel under Injection Pump". Attach a fuel line from the source of fuel supply to the inlet fitting on the pump housing. Remove the delivery valve holder (2), Illust. 6, from the No. 1 injector, extract the delivery valve spring (3) and delivery valve (5), and replace the delivery valve holder. Move the control rod (45B) so the mark on its undersize at the rear is in line with the edge of the bushing. At this position, the split in the control sleeve toothed segments are straight out or perpendicular to the control rod.

Rotate the pump so the No. 1 injector starts to rise -- this can be determined by watching the tappet (71-A) through the inspection cover (38-A) opening. Turn on the fuel supply and carefully continue turning the pump camshaft until the flow of fuel from the delivery valve holder ceases. Set the indicator at zero on the graduated disc or at a recorded number of degrees on the disc. Turn the pump through a complete cycle and again check the position of the pointer on the indicator when the fuel stops flowing from the delivery valve holder. Blowing the fuel from the depression in the top of the delivery valve holder will allow the exact position of fuel

# Timing the Bosch Fuel Injection Pump - Continued

flow stoppage to be more clearly observed. The pump must be turned very slowly as this point is reached.

When the fuel stops flowing, the "SI" mark on the injection pump gear hub should line up with the "SI" mark on the face of the end plate (15). If the fuel does not stop flowing when these marks line up, the tappet adjusting screw (66) should be: (A) Raised to make the fuel stop flowing sooner, and (B) lowered to make the fuel stop flowing later. The pump turns in a clockwise direction when viewed from the front. The "SI" mark on the end cover is reached approximately 45° after passing the vertical center-line of the pump.

With the flow of fuel stopped at the time the "SI" marks on the hub and end cover line up (adjusted with the tappet screw for No. 1 cylinder), and delivery valve and spring may be replaced. The point at which the fuel stops flowing is called the start of injection and is abbreviated with the letters "SI". Remove the delivery valve for No. 5 plunger and turn the pump to make the fuel stop flowing from that delivery valve holder. The start of injection or stoppage of the fuel flow for this plunger should occur exactly 60° of rotation after that for No. 1 plunger. If the fuel flow stops before 60° of turning has elapsed, the tappet adjusting screw for that plunger should be lowered. If the fuel flow stops after 60° of turning has elapsed, the tappet adjusting screw should be raised. When the tappet adjusting screw is set to make the fuel flow stop exactly 60° after that for No. 1 plunger, the delivery valve and spring may be replaced for this plunger.

Repeat this process for No. 3 plunger. The "SI" for this plunger should be exactly 60° after that for No. 5. When this has been properly adjusted, check the "SI" for plunger No. 6. It should like-

wise be 60° after that for No. 3. Repeat this process for No. 2 plunger. The "SI" for this plunger should be exactly 60° after that for plunger No. 3. Again repeat the process by turning the pump to the "SI" for No. 4. It should be 60° after that for No. 2 plunger. When this has been adjusted, see how many degrees of rotation are required to reach the "SI" for plunger No. 1, and see if this coincides with the "SI" marks on the end plate of the pump and pump gear hub. The "SI" for No. 1 should be 60° after that for plunger No. 4. This will be a check on the accuracy of your work. If these marks do not coincide after 60° rotation from the "SI" for plunger No. 4, the entire process must be gone over again, starting off with cylinder No. 1, and corrections made wherever necessary.

With each plunger properly timed for start of injection, "SI", turn the camshaft until plunger No. I rises as far as the cam will lift it. Lift the tappets with a screw driver to see if there is at least .020" vertical free travel of the plunger before it strikes the delivery valve seat. For accurately checking this free travel from the maximum lift position, a short rod of small diameter can be slipped down into the delivery valve holder until it contacts the top of the plunger (delivery valve removed). A dial indicator contacting the top of the rod will show the exact clearance between the top of the plunger and the delivery valve seat when the tappet is raised from the maximum lift position. Check each plunger for this minimum clearance at the high point of lift of the camshaft.

# Calibration of the Bosch Fuel Injection Pump

For calibration, the fuel piping for the pump should consist of a lead from a source of clean fuel to the forward fitting on the fuel supply pump. A pipe from the outlet fitting should include a 15-pound capacity pressure gauge and should read to the injection pump at the rear of the injection pump

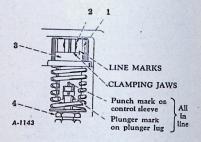
# Calibration of the Bosch Fuel Injection Pump - Continued

housing. A line for the return fuel should lead from the fitting at the front of the injection pump housing back to the original fuel supply container. The use of a filter in the outlet fuel line from the supply pump is recommended. Standard injection pipes and injection nozzles (set for 700 lbs.) are also necessary.

Run the pump to be sure that all air is bled out of the system. Bleed the air from the nozzles before making any quantity test. Attach a fixture to the pump and control rod and set the rod 6 mm. or 15/64" from the full stop position. Operate the pump for exactly four minutes at 550 R.P.M. The quantity of fuel delivered from each nozzle into the graduated beaker should be 150 cc. If this amount of fuel is not delivered from each nozzle, the following adjustments should be made:

- a. Move the control rod to the full stop position so that the clamping screw (2) Illust. 5, in the jaw of the control segment is accessible.
- b. Loosen the clamping screw of the segment (1) for the plunger for which the quantity of fuel delivered was not correct.
- c. Facing the inspection cover opening, turn the control sleeve (3) to the right if fuel delivery was too low. Only a slight movement of the sleeve is required.
- d. If fuel delivery was too high, turn the control sleeve (3) to the left.
- e. Tighten each lock screw (2) that has been loosened.
- f. Take another test run of the pump with the control rod in exactly the same position as set for the initial test.

- If the adjustment of the segments (1) was not satisfactory, repeat the foregoing steps until all are delivering the quantity required.
- g. The average delivery from the nozzles should be within 7.5 cc. of the amount specified. The maximum variation in the delivery of any nozzle from the average delivery for all nozzles should not exceed 6 cc.



Points of Adjustment for Timing and Calibrating Pump Plungers.

- (1) Toothed segment. (2) Clamping screw.
- (3) Control sleeve.
- (4) Tappet adjusting screw.

Move the control rod to a position 9 mm. or 25/64" from the full stop position. Repeat the test run outlined above. The quantity of fuel delivered from each nozzle should be 250 cc. If the control segments had to be readjusted to get the average fuel delivery from all nozzles within 12.5 cc. of the 250 cc. quantity, or within 10 cc. of one another, a re-run should be made at the 6 mm. or 15/64" setting of the control rod. The adjustment of the control segments should be balanced to give satisfactory fuel delivery at both the 6 mm. (15/64") and 9 mm. (23/64") setting of the control rod.

# Calibration of the Bosch Fuel Injection Pump - Continued

When pumps are tested prior to disassembly, and a pump cannot be made to deliver fuel within the limits specified, look for faulty delivery valve action, a faulty cam, and broken plunger springs, faulty test nozzles, or worn plungers. Switching of the test nozzles should not change the quantity of fuel delivered. If this does change the quantity of fuel delivered, the nozzles should be rechecked for uniform setting. If the pump delivers uniformly at these two settings, there is every assurance the engine will idle properly, and give smooth performance throughout the load range. This assumes the mechanical condition of the engine and the nozzles in the cylinder head are operating effectively.

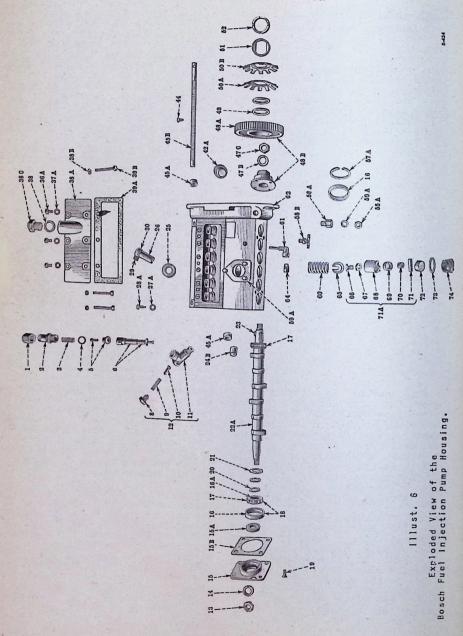
Reassemble the governor to the pump. Operate the pump for exactly four minutes at 550 R.P.M. with the control lever held wide open. The quantity of fuel delivered should be 260 cc. The maximum variation from the average of fuel delivered from any one nozzle should be 10.4 cc. and the average quantity of fuel should be within 13 cc. of the 260 cc. specified. If this amount is not delivered, remove the cover for the operating lever stops and adjust the forward stop screw to obtain this amount. Turning the screw in decreases the fuel delivery. Be sure to lock the screw after adjusting. This will be as close as the horsepower of the engine and maximum idle speed of the engine can be set by bench testing of the fuel pump.

Whenever a governor has been reassembled and the setting of the stop plate (2), Illust. 12, is not known because new parts have been installed, it is necessary to operate the pump as closely as possible to the rated load speed or 600 R.P.M. of the pump. At this speed, the smoke limit cam (24), Illust. 10, should just float

against the rear corner of the step on the stop plate (2), Illust. 12. When set at the factory, the position of the parts is marked as indicated in Illust. 12. If the old parts are reinstalled, they can be made to line up with the scratch marks already inscribed. A straight edge against the forward step of the stop plate should show the alignment of the forward step of the stop plate with the scratch lines on the governor end cover. The scratch line on the smoke limit cam should line up with the mating mark on the fulcrum yoke lever. Where new parts are used, it may be necessary to reset both the cam and plate. If this is the case, eradicate the old scratch lines and add new lines at the new setting. Be sure the proper spring gap is used for the governor springs as outlined under the "Governor Re assembly". The setting of the stop plate and the smoke limit can have a definite effect on engine performance which can be checked after assembly of the pump to the engine.

Before attaching the inspection covers to the pump, inscribe a line on both the control sleeve toothed segment and the control sleeve of the plunger so that their position at the time of calibrating can be duplicated, should it become necessary to disassemble the pump again. Check all lock screws and adjustments for tightness before replacing the inspection covers. Be sure the pump is filled with the proper grade and amount of lubricating oil before testing.

The injection pump can now be replaced on the engine and timed. If the high idle speed of the engine is not 1200 R.P.M., adjustment of the forward stop screw for the control lever will give the speed desired. Readjust the control mechanism as outlined in the "Starting System", Section 10. If the engine smokes excessively under load, check the timing for the best (Continued on page 10.)



# REPAIR SECTION

	FUEL SISIEM - Continued
Description	Adjusting spacer, .025". Adjusting spacer, .055". Adjusting spacer, .065". Drive gear spring disc, niner. Drive gear spring disc, outer. Drive gear adjusting nut lock washer. Hex. nut, 1/4" N.C. Fuel supply pump housing lock washer. Bearing retainer ring. Lubricating oil level cock. Fuel supply pump stud. Fuel supply stud. Fuel sushing. Fappet shell with insert. Tappet roller bushing. Tappet roller Tappet roller Felt cushion. Closing plug gasket.
Ref.	49 50A 50B 51A 52A 55A 56A 56A 56A 56A 56A 56A 56A 57A 57A 57A 57A 57A 57A 57A 57A 57A 57
Description	Camshaft oil thrower. Camshaft key. Camshaft key. Control rod protection cover. Plunger spring seat, upper. Control sleeve. Barrel set screw. Barrel set screw. Toothed segment clamping screw, short. Inspection cover fastening screw, short. Inspection cover fastening screw, short. Inspection cover fastening screw, lock washer. Inspection cover fastening screw, long gasket. Inspection cover fastening screw, long screw. Control rod bushing. Lock washer. Drive gear hub nut. Drive gear.
Ref.	21 22A 24B 25 26A 26A 26A 26A 26A 26A 26A 26A 26A 27A 26A 26A 26A 26A 26A 26A 26A 26A 26A 26
Description	Delivery valve holder protection cap. Delivery valve holder. Delivery valve holder. Belivery valve holder. Belivery valve holder. Belivery valve and seat. Plunger and barrel. Valve spring. Valve spring. Valve body. Overflow valve. Camshaft hex. nut. Lock washer. End plate with oil seal. End plate oil seal. End plate oil seal. Camshaft bearing, outer race. Camshaft bearing, the balls. Camshaft bearing, i.H. and R.H. End plate fastening screw. Bearing adjusting washer, o. 1M/M. Bearing adjusting washer, o. 2M/M. Bearing adjusting washer, o. 2M/M. Bearing adjusting washer, o. 2M/M.
Ref.	1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2

# Calibration of the Bosch Fuel Injection Pump - Continued

position. If it continues, and all other items of the system have been checked, the stop plate and the smoke limit cam may have to be readjusted. If the smoking condition of the engine is satisfactory, but apparently there is insufficient power for overload or lugging ability, a slight adjustment of the plate or cam may be necessary. The setting of the cam and plate can only be made accurately when the engine is tested with a dynamometer where it can be given the rated load and overload. Be sure to check all other possible parts of the engine and pump which might contribute to faulty operation, before attempting to set these parts.

# Repair of the Bosch Fuel Injection Pump

If it ever becomes necessary to adjust or disassemble the fuel injection equipment, it is of utmost importance that cleanliness be practiced. Should any dust, grit, water, etc., reach the working parts of the injection pump, serious damage will result that may make costly shut-downs and repairs necessary. Only after its accessories have been washed thoroughly with clean Diesel fuel to eliminate entirely any dirt or dust, should disassembly of the equipment be attempted.

Repair of the injection pump is divided into three main units: The injection pump housing assembly; the supply pump assembly; the governor assembly.

With the complete injection pump removed from the engine, or while it is assembled to the engine, the fuel supply pump may be replaced after taking off the three nuts holding the unit to the studs (59-A), Illust. 6. Pull on the fuel supply pump housing (15-A), Illust. 9, to remove it. Be sure to use a good gasket (16) when replacing the fuel supply pump.

With the injection pump removed

from the engine as indicated in the procedure for this operation given in the Operations Section, the governor and pump housing assemblies can be separated. After removing the nine cap screws joining the governor and cover (38) Illust. 10, to the pump housing (62), Illust. 6, pull the cover to the rear until the dowels are free from the housing. Then slide the cover to the side to disengage the control rod linkage pin (27), Illust. 10, from the control rack (45-B), Illust. 6. Disassembly of each unit can now be performed independently of any other unit.

# Disassembly of the Pump Housing Assembly

Remove the inspection cover (38-A), Illust. 6, the four barrel set screws (28-A) from the above inspection opening, the control rod securing screw (44) from the back side of the pump, the four closing plugs in the base of the pump, and the overflow valve (12). Wrench SE-1296 is made to fit the slot in these plugs. A similar tool can be made from a drag-link screw driver rounded to fit the 3/4" radius at the base of the slot.

Set the pump gear hub in a vise and remove the governor drive gear hub nut (47-C). Bend back lock (51) and remove the gear adjusting nut (52) (Service tool SE-1302). Lift off the lock, the two drive gear spring discs (50-A) and (50-B), the adjusting spacers (49), and the governor drive gear (48-A). Use puller SE-1303 to remove the gear hub (48-B) (with gear (48-A) in place) or turn the adjusting nut (52) on a few turns and pry the hub off, using a screw driver on each side under the nut while tapping on the end of the camshaft (22-A). Remove the key (23).

Remove the lubricating oil overflow tube with plug (61) from the base of the housing (62). Turn over the pump camshaft and place tappet holders (SE-1308), or their equivalent, between each tappet screw (66) and its lock nut (67).

# Disassembly of the Pump Housing Assembly - Continued

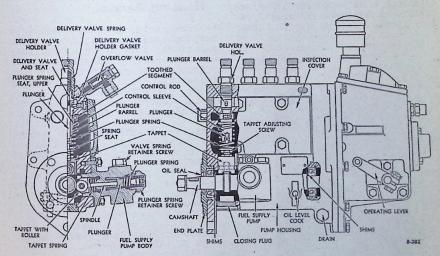
Remove the pump gear hub, the key in the camshaft, and then take off the end plate (15) with its oil seal (15-A), and the bearing outer race (16). The camshaft assembly can now be removed from the housing. Use a bearing race puller (SE-1300) to remove the bearing races (16-A) from the camshaft (22).

The complete tappets (71-A) can now be removed from the housing. The plunger (6), the lower spring seat (65), and the plunger spring (60) can all be removed through the holes in the base of the pump housing. The upper spring seat (25) and the control sleeve (26) with toothed segment (30) can now be removed through the inspection cover opening.

Remove the delivery valve holder (2) for the same plunger and lift out of the spring (3) and delivery valve (5). Use a block of wood and drive the plunger barrel (6) out of the housing with the delivery valve seat (5) and gasket (4). Flush the barrel and plunger with clean oil and slide the plunger within the barrel. Keep all the parts for this cylinder together before repeating the process for the other cylinders.

# Repair of the Pump Housing Assembly

All parts should be carefully washed in clean Diesel fuel and blown dry with compressed air (free from water or dirt). Exceptionally dirty parts should be cleaned in paint remover. Gummed or stick plungers should be soaked in aceton



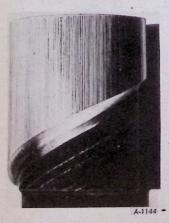
Illust. 7 Cross Section of the Bosch Fuel Injection Pump.

# Repair of the Pump Housing Assembly - Continued

If wear is excessive, the bushings (45-A), Illust. 6, may be replaced. They must be line-reamed to a dimension of .4331 to .4338 . Clearance between the shaft should be from .0015 to .0027 .

When replacing the outer bearing race (16), replace also the inner bearing race (16-A) and bearing (17). The end play of the camshaft (22) when assembled complete is .004" to .008". The lip of the oil seal (15-A) faces the interior of the pump housing (62).

The plunger and barrel (6) should be carefully inspected for wear. If the plunger has lost its mirror-like appearance and looks dull or grey, it is a sure indication that the plunger has been worn due to dirt in the fuel. The edge of the plunger helix should appear sharp under a magnifying glass and the plunger should not be nicked or scratched. The upper portion of a badly worn plunger is magnified many times in Illust. 8. If there



Illust. 8
Picture of a Badly
Worn Plunger.

is some doubt as to whether it is necessary to replace the plunger, assemble the pump and test it as outlined under the "Basic Tests and Adjustments" heading. Wipe the plunger only with cleansing tissue, never handle the polished surface with bare fingers.

Always use a new delivery valve gasket (4) Illust. 6. The delivery valve (5) should fall freely in its seat with both parts lubricated.

The toothed segment (30) should never be moved on the control sleeve (26) unless either are to be replaced. The scratch mark on both parts should line up. If the guide slots are badly worn, replace the sleeve. When assembling new parts, line up the gap in the segment with the slots in the segment for initial setting. Change the setting as explained under "Basic Tests and Adjustments".

# Reassembly of the Pump Housing Assembly

When reassembling plunger units in the pump housing, complete all the operations for any one cylinder before proceeding to the next. It is absolutely essential that each plunger (6) Illust. 6, is replaced in the barrel from which it is removed. Lubricate the plunger before inserting in the barrel.

Separate the plunger and barrel (6). Insert the barrel in the pump with the long slot in the top of the barrel facing the inspection cover side of the pump. Screw in the barrel set screw (28-A) with its gasket (27-A). Assemble the delivery valve and seat (5), followed by gasket (4), spring (3), and delivery valve holder (2). Tighten the delivery valve holder to 35 ft.-lbs. torque. Place a cap (1) over the holder.

Replace the control rod (45-B) and turn in its securing screw (44) with the long end to the rear. Insert the control sleeve (26) and toothed segment (50) through the inspection cover opening and slide

# Reassembly of the Pump Housing Assembly - Continued

the unit over the end of the plunger barrel. Move the control rod to a point where the spot on the round surface near the rear of the rod is flush with the inside surface of the housing. Raise the control sleeve (26) and segment (30) to engage the teeth on the control rod so that the split in the segment (30) faces directly out, perpendicular to the control rod. Slide the upper plunger spring seat in place with the groove toward the spring.

Insert the plunger spring over the sleeve from the bottom. Dip plunger (6) in clean Diesel fuel and use service tool SE-1298 or its equivalent to gently insert the plunger (6) in its barrel. Be sure the flange on the plunger with the punch mark freely enters the slot of the sleeve (26) which has a similar mark, Illust. 5. Withdraw the plunger slightly and attach the lower plunger spring seat. Be sure the recess in the seat is toward the bottom. Assemble the tappet (71-A), Illust. 6, and insert it into the bore in the pump housing. The pin (71) engages a slot in the housing and prevents the tappet toward the top of the pump housing, engage the flange on the plunger in the control sleeve slot, and slip the tappet lifter SE-1308 between the tappet screw (66) and its lock nut. Move the control rack back and forth to check the free movement of the parts.

Repeat the foregoing process to replace all assemblies for each cylinder. Check after each installation for freedom of parts. Remove any assembly that causes difficulty before proceeding further.

Replace the rear bearing race (16) in the pump housing. (62). Also replace the forward bearing race (16) in the end plate (15) after the oil seal (15-A) is in place

with the lip facing the bearing. Assemble the camshaft to the housing and fasten to end plate. Check the end play of the camshaft. Arrange shims (20) for end clearance of .004" to .008", preferably .004". Tappet holders can now be removed. Follow the procedure outlined under "Basic Tests and Adjustments".

Replace key (23). Set the drive gear hub (48-B) in the gear (48-A) and assemble both to the camshaft. Tighten nut (47-C). Assemble adjusting spacers (49), spring discs (50-A) and (50-B), lock washer (51), and gear adjusting nut (52). The spacers (49) are furnished in various thicknesses, namely .035", .049", .065". Use one or more spacers, as required, so that 3 to 3-1/4 ft.-lbs. torque are required to turn the gear (48-A) when the nut (52) is drawn tight. Lock the lock washers (51) against the nut (52).

If only the pump housing has been repaired, assembly of the supply pump and governor can be completed, the pump set for approximately full load delivery as outlined under the "Calibration" heading, and the unit reassembled to the engine. Retime for best operation as outlined in the Operations Section.

# Disassembly of the Supply Pump

Remove the valve spring retaining screws (10), Illust. 9, with gasket (9), and lift out springs (8) and valves (7). Keep these parts in order so they can be replaced in their original position.

Take off the plunger spring retainer screw (11) with gasket (12), and lift out spring (13) and plunger (14). Remove from the housing (15-A) the tappet-securing pin (1), and slide out the tappet assembly (1), (2), (3), and (4). Spring (5) and spindle (6) can then be removed.

Removing the tappet waist pin (2) from the tappet shell (4) releases the tappet roller (3).

# Repair of the Supply Pump

Flush all parts with clean Diesel fuel. Examine all valve seats and the ends of the valves. If the ends of the valves are not smooth they may be refinished in a speed lathe. The spindle (6) is a lapped fit in the housing (15-A); replace the spindle if it is worn excessively.

# Reassembly of the Supply Pump

Reassembly of the supply pump is the reverse of the disassembly procedure.

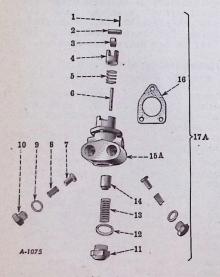
Be sure all parts are clean before proceeding. If the supply pump will not prime after reinstalling it, remove the inlet screw (10), put in a few drops of lubricating oil, and replace the screw. With the overflow valve on the pump functioning properly, the supply

pump should maintain 6 to 8 lbs. of fuel pressure in the pump housing sump. The free length of the overflow valve spring (9), Illust. 6, is 5/8".

# Disassembly and Repair of the Governor

Remove the governor inspection cover (53), Illust. 10. Take off the upper and lower operating stop covers (88) and (89). Take out the four spring cap screws and remove the retainer end cup (65). After turning off the bearing nut (37), the bearing (35) outer and inner governor spring spacers (79) to (84), the outer and inner governor springs (33) and (32) can then be slipped out. Removing the cap screws (15) from the bearing support plate (10) permits the governor weight and shaft assembly (18), complete to be pulled from the end cover (38). The sleeve (19) with the bushing and thrust bearing can now be slipped from the pegs of the fulcrum lever (20) for removal.

(Continued on page 15.)



Exploded View of the Fuel Supply Pump.

Ref.	Description
1	Tappet securing pin.
2	Tappet wrist pin.
3	Tappet roller.
4	Tappet shell.
5	Tappet spring.
6	Spindle.
123456789	Valve, inlet and outlet.
8	Valve spring.
9	Valve spring retainer
	screw gasket.
10	Valve spring retainer
	screw.
11	Plunger spring retainer
	screw.
12	Plunger spring retainer
	screw gasket.
13	Plunger spring.
14	Plunger.
15A	Fuel supply pump housing.
16	Fuel supply pump housing
	gasket.
17A	Fuel supply pump, complete.
-	

# Disassembly and Repair of the Governor - Continued

If there is excessive play between the fulcrum lever assembly (20) and the bracket pin (77), or between the fulcrum lever bracket (75) and the operating shaft (74), these parts may be removed after taking out the spring plate set screw (75) and pulling the operating shaft (74) from the end cover (38). A socket wrench with an opening 3/16" across the flats is necessary. The ends of the spring on the plate (78) should contact both sides of the prong. The control rod link (28) can be removed from the control rod link pin (31) if there is excessive play between the pin and the fulcrum lever assembly (20). Do not remove the sure the nut is tight on the square head bolt (23). Do not remove the stop plate bridge (55) and the stop plate (56) unless they must be replaced.

The governor weight and shaft assembly (20) may be disassembled if necessary. Unless the bearing or shaft is in need of replacement, there is no cause to separate these parts. If the weights (5) have excessive play on the governor weight pins (3), the cotter keys (1) and washers (2) can be removed, and the pins (3) driven from the governor spider. Do not drive on the drilled end of the pin. The bushings (4) in the weights can be replaced and line-reamed to size. Both bushings are not reamed to the same size. The bushing with the large bore is on the same side of the governor weight as the long arm which extends from the weight to operate the governor sleeve (19). This bushing is reamed to .3700" to .3705" for the .3680" to .3685" end of the pins (3). The small diameter bushing is reamed to .3545" to .3550" end of the pins (3). The small diameter bushing is reamed to .3525" to .3550" end of the pins (3). The source of the shaft (14) is ground to .385" to .390" while the bushing in the sleeve (19) is finished to .3750" to .3756".

The governor weight pins are hol-

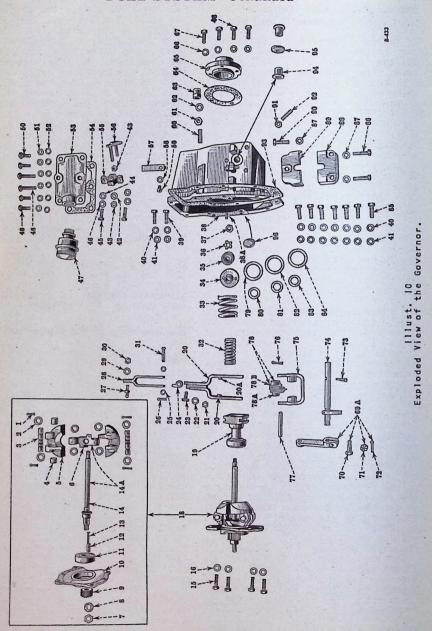
low from the large end almost to the small diameter end. Holes are drilled in the pins (3) meet this long hole. The grooves at these holes distribute the oil to the bushings in the governor weights. The governor weight shaft (14) is drilled from the gear end back to the area of travel of the sleeve (19). The spider (6) is also drilled to meet a hole in the shaft. The baffle, Illust. 6, is so situated that it collects oil thrown from the gears. The center of the baffle contacts the spring-loaded governor shaft plunger oiler (12) and (13), Illust. 10. Oil flows from the reservoir, through the plunger, and inside the shaft from where it is distributed to the sleeve (19) and to the governor weights through drilled holes i the shaft, the spider (6) and th pins (3).

If wear is excessive, the bushings (94) may be removed from the end cover (38). After pressing replacement bushings in place, lineream them to .377" to .378".

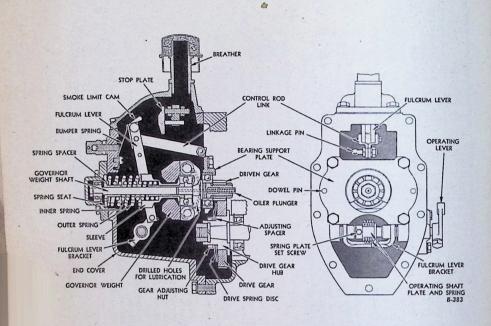
# Reassembly of the Governor

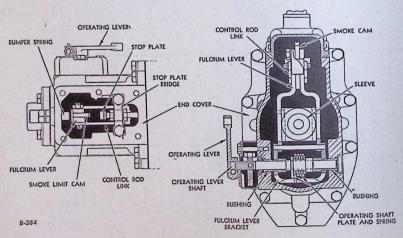
If new bushings have been assembled to the weights and properly line-reamed to size, hold the weight (5), Illust 10, in place and press the pin (3) into the spider (6), being sure the small end of the pin enters from the large bore bushing side of the weight. Cotter key holes should be equal distance from the weight on both sides. Replace washers (2) and cotter keys (1). The head of the cotter key is normally on the inside. Bend both ends of the key back around the pin. If bearing (11) has been removed from the shaft (14), press the bearing into the bearing support plate (10) and then assemble the unit to the shaft. Push the driven gear on the end of the shaft and lock the nut after tightening. Bend the lock over, all the way around the nut Replace the governor shaft plunger oiler (12) and the spring (13) after blowing air through holes in the shaft.

(Continued on page 19.)



. Description	Spring retainer end cap gasket. Spring retainer end cap. Spring retainer end cap. Boll look washer. Smring retainer end cap holt	Spring retainer end	<b>d</b>			Operating shaft plate. Outer spring spacer, .020". Inner spring spacer, .020".	Inner spring spacer, Outer spring spacer,	Inner spring Outer spring	Governor end cover bo long.		ogo	Operating lever stop cover,	Operating lever stop cover	Hex nut. Set screw.	Governor end cover gasket, Operating lever shaft	bushing. Operating lever shaft oil seal.
Ref.	65 65 67	689	69A 70 71	27.25.47.	77	8 6 8	818	84 84	85	87	88	89	90	198	98	95
Description	Governor spring, inner. Governor spring, outer. Spring seat. Governor weight shaft bearing (spring end).	Governor weight shaft bearing lock washer. Governor weight shaft bearing	nut. Governor end cover. Bearing support plate dowel.	Governor end cover bolt. lock washer. Governor end cover bolt	Stop plate screw washer.	Stop plate bridge bolt washer.	Stop plate bridge bolt. Stop plate bridge lock washer.	Breather. Governor inspection cover bolt, center.	Governor inspection cover bolt. Governor inspection cover	bolt, short. Governor inspection cover	Governor inspection cover bolt washer.	Governor inspection cover with baffle.	Governor end cover gasket. Stop plate bridge.	Stop plate (end cover housing). Bumper spring.	bumper spring lock washer. Screw.	Junper spring adjusting screw. Hex nut. Bumper spring cap gasket. Bumper spring cap.
Ref.	32 33 34 35	36	38 38A	41	42	44 1	46	48	50	51	52	53	55	56	200	00000
Description	Cotter pin. Governor weight washer. Governor weight pin. Governor weight bushing.	Governor spider with pins. Governor driven gear nut. Governor driven gear	lock washer.  Governor driven gear.  Bearing support plate with	Governor weight shaft bearing (drive end). Governor shaft plunger	Governor shaft plunger	Governor weight shaft. Spring retainer end cap	Governor weight shaft and spider.	Cotter pin. Bearing support plate bolt. Bearing support plate	bolt lock washer. Governor weight and shaft. Sleeve with bushing and		Hex. Jan nut.	lock washer. Smoke limit cam screw	(fulcrum lever).	Control rod link pin washer.	linkage	Control rod linkage pin lock washer. Hex. nut. Control rod link pin.
Ref.	10045	978	60	11 21	13	14	14A	15	138	20 80 A	222	. 22	24	255	27	29





Illust. II Cross Section of the Governor.

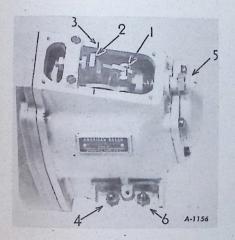
# Reassembly of the Governor - Continued

Assemble the fulcrum lever (20) to the fulcrum lever bracket with pin (77). Bend both ends of the cotter keys (76). Attach the control rod link (28) to the fulcrum lever, with the linkage pin (27) on the smoke limit (24) cam side of the fulcrum lever. Set the assembly in the end cover (38), slide the operating lever shaft (74) in place, hold the shaft plate with spring (78) in place, and push the shaft in as far as it will go. The spring end of the plate (78) faces the control lever side. Be sure to engage the prongs of the spring over the bracket (75). Locate the set screw (73) in the tapped hole in the plate (78) and in the hole in the shaft (74). Use a 3/16" socket wrench to tighten the set screw.

Engage the slots of sleeve (19) in the pins of the fulcrum lever (20). Then slide the governor shaft assembly (18) into place. Locate the bearing support plate (10) over the dowel pins in the end cover (38). Be sure the cut-out side of the bearing plate is on the bottom, and that the cap screws with lock washers are all drawn tight.

Where original parts of the governor are being reassembled, put the
inner and outer governor springs
(32) and (33) in place. Set the
inner and outer springs spacers
(79) to (84) on the spring seat
(34) and slip the spring seat over
the shaft. Slide bearing (35),
with the projecting side against
the shoulder, on shaft (18). Tighten nut (37) with lock (36) in
place, bend the lock, and replace
the end cup (65) with the gasket
(64).

Where new springs or parts are included in the governor assembly, replace the outer spring and move the control lever (69-A) toward the front of the pump all the way. The end of the spring should extend 1/16" outside the end of the end cover (38). If the spring does not extend slightly, measure the distance from the outer spring seat in the sleeve (19) to the out-



Illust. 12
Top View of Governor with the Inspection Covers Removed.

- (1) Scratch line on smoke limit cam and fulcrum lever.
- (2) Stop plate.
- (3) Scratch line on end cover to line up stop plate.
- (4) High idle speed stop screw.
- (5) Bumper spring adjuster.
- (6) Pump shut-off stop screw.

# Reassembly of the Governor - Continued

side of the end cover (38) where the end cup attaches. Measure the length of the outer spring. Add spring spacers of .020", .042", .058", or .083" thickness, or a combination of these spacers, to make the distance measured up to 1/16" but not more than 1/16" longer than the length of the spring. The counterbore in the sleeve (19) for the inner spring (32) is much deeper than that for the outer spring (33).

With the proper outer spacer, if any, and the inner spring in place, hold the spring seat lightly against the outer spring, being sure the entire assembly is as far forward as it will go. With a depth gage, measure the distance from the end of the inner spring

to the outer surface of the spring seat. Holes in the spring seat are provided to make this measurement. Try several positions of the spring seat. Subtract .125" from this dimension to allow for the thickness of the spring seat. Inner spacers of necessary thickness should be used to reduce the measurement to .177" (4.5 mm.) or the required spring gap. Put the springs in place in the governor, place the spacers required on the spring seat (34), slide the seat on the shaft (18), and complete the assembly as outlined in the foregoing paragraph.

After reassembly is completed, clean with Diesel fuel. Dry off any excess oil with clean, dry air. Attach the unit to the pump housing and test as outlined under the heading, "Basic Tests and Adjustments".

#### POWER TAKE-OFF

#### Front Power Take-Off

After taking the driven member from the end of the front power take-off shaft, remove the six 3/8-inch hex. nuts from the studs (4), Illust. 1 in the fan drive pulley (3). Lift off the nut locks (11), felt washer retainers (10), felt washer (9), shaft retainers (8) and pull out the front power take-off shaft. The coupling (7) can be slid from the studs on the fan drive pulley (3).

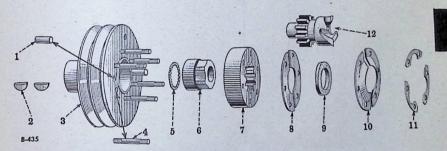
Reassembly of this unit is the reverse of the removal procedure.

When the complete radiator is removed from a tractor equipped with the front power take-off, the replacement procedure necessitates special steps so that the lower radiator water tank will be aligned with the engine crankshaft and the front finished face will be square

with the center line of the crankshaft.

After the radiator is replaced, loosen the bolts holding the lower radiator water tank to the main frame side channels. Bolt an alignment gage coupling similar to that sketched in Illust. 2 to the front power take-off coupling. Screw the alignment gage coupling shaft into the coupling. Slip the alignment gage bearing on the shaft and insert it into the bore of the radiator tank. The bearing should enter readily the outer flange should fit all around against the machined face of the water tank. Use a feeler gage for this purpose.

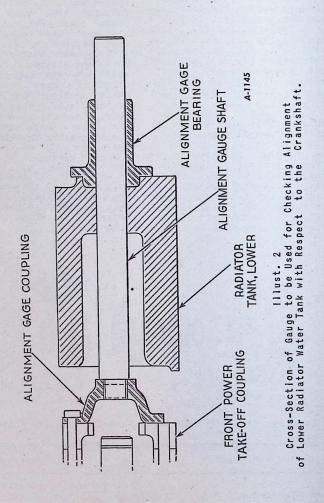
If necessary, slightly slot the bolt holes in the main frame side channels to facilitate alignment. When alignment is perfect, tighten bolts in the water tank and side channels.



Exploded View of Front Power Take-Off Coupling Assembly.

Ref.		Ref. No.	Description
1 2 3 4 5 6	Pin. Key (No. 23 Woodruff). Pulley with drive pins. Stud. Lock washer. Nut.	7 8 9 10 11 12	Coupling (11 teeth). Shaft retainer. Felt washer. Felt retainer. Lock. Starting crank adapter.

# POWER TAKE-OFF - Continued Front Power Take-off Coupling



# Front Power Take-off - Continued

In order to eliminate the necessity for going through the aligning procedure on future removals of the radiator, two 1/2 inch dowels may be assembled to the side of the tank by drilling two 15/32 inch holes through the main frame side channels and into the water tank when alignment is secured and both parts are tightly bolted together. Finish-ream the holes to .497 inch. Space the holes conveniently near the bolts to avoid interference, and use 1-1/8 inch to 1-3/8 inch length dowels.

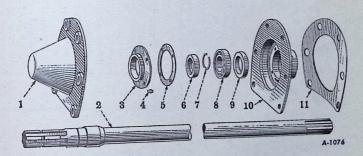
## Rear Power Take-off

The rear power take-off consists of a shaft mounted in the rear of the main frame which passes inside the upper spline shaft of the transmission and is driven from the

transmission drive gear. When not in use, the rear end of the shaft can be enclosed with the cover (1), Illust. 3.

To remove the shaft with its attached parts, take out capscrews holding bearing cage (10) to the main frame and use puller capscrews to withdraw the entire unit. After taking the capscrews out of the bearing retainer (3), the retainer with oil seal (6) and gasket (5) can be removed from the shaft. Taking the snap ring (7) from the shaft (2) allows the shaft to be pulled from the bearing cage (10). The bearing, (8) and the oil seal (9) can now be removed from the bearing cage (10). The leather lip of oil seal (9) faces the drive bevel gears. The lip of seal (6) faces the bearing (8).

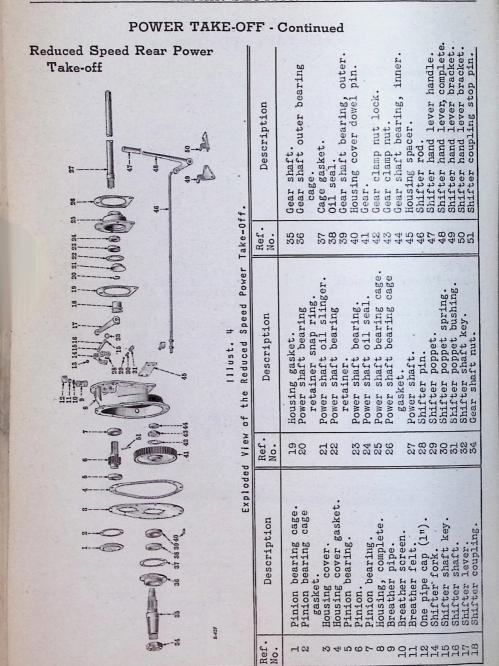
Reassembly and replacement is the reverse of the above. Be sure to use new gaskets (5) and (11).



!llust. 3 Exploded View of the Rear Power Take-Off.

Ref.	Description	Ref. No.	Description
1 2 3 4 5 6	Cover. Shaft. Retainer with seal. Lubricator. Gasket. Oil seal, outer.	7 8 9 10 11	Snap ring. Bearing. Oil seal, inner. Cage with seal. Gasket.

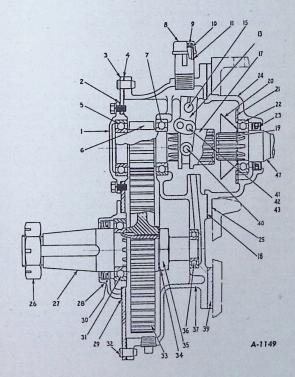
# REPAIR SECTION



# Reduced Speed Rear Power Take-off - Continued

The reduced speed rear power takeoff attaches to the rear of the
main frame. A long shaft of the
unit extends forward, passes inside the upper spline shaft, and
is driven by a spline within the
transmission drive gear. The speed
reduction portion of the assembly
is contained within the housing (8),
Illust. 4, which can be removed by
disconnecting shifter rod (46) from
shifter lever (17), shifting the

lever (17) to the engaged position, removing capscrews holding the housing (8) to the main frame, and lifting spacer (45) from between the two castings. This assumes that all parts attached to the gear shaft (35) and not shown in Illust. 4 which might interfere with the removal of the unit, are removed prior to proceeding as outlined. The power shaft unit, including items (19) to (27), can be removed by applying puller capscrews to the tapped holes provided in the bearing cage (25).



Illust. 5
Cross-Section of the Reduced Speed Power Take-Off.

# Reduced Speed Rear Power Take-off - Continued

The power shaft (27) and the oil slinger (21) can be removed from the power shaft unit after the snap ring (20) is removed. Taking out the capscrews in the bearing retainer (22) allows the bearing (23) and the oil seal (24) to be removed from the bearing cage (25). The lip of the leather oil seal faces the drive bevel gear compartment.

The disassembly of the parts in the housing (8) starts with the removal of the pinion bearing cage (1). The bearing (5) may or may not come out with the bearing cage (1). (Also refer to Illust. 5.) Take out the capscrews and the dowel pins (40) in the housing cover (3). Remove the cover, taking with it the gear shaft (35) and the gear (41). The bearing (44) may or may not come out with the shaft.

Now the pinion (6) with the bearings (5) and (7) can be pulled from the housing. The shifter coupling (18) will then drop out. To remove the shifter fork (14) assembly, lift out the shifter pins (28), remove the shifter poppet bushing (31), poppet spring (30), and poppet (29). Take out the screw in the shifter fork (14), and pull the shifter shaft (16) out of the housing (8) with the shifter lever (17).

To disassemble the gear shaft (35), pull the bearing (44) from the shaft, and remove the nut (43) with lock washer (42). The gear (41) can then be pulled from the shaft. Removing the bolts in the bearing cage (36) allows the shaft (35),

the bearing cage (36), gasket (37), oil seal (38), and bearing (39) be pulled from the housing cover (3). Pulling the bearing cage from the shaft allows the oil seal to be replaced. The lip of the leather oil seal faces the inside of the housing.

Reassembly of the unit is the reverse of the disassembly procedure. When replacing the shifter fork (14), be sure there is equal clearance between shifter pins (28) and the shifter coupling (18). Do not turn the shifter poppet bushing (31) in too far, or it will strike against the shifter fork.

# Belt Pulley

The belt pulley attaches to the main frame over the end of the power take-off. After removing the mounting bolts from the carrier (28), Illust. 6, the entire unit can be slid from the end of the power take-off shaft.

# Disassembly of the Belt Pulley

The pulley (3) can be pulled off after taking out two 1/2" capscrews and bending back the capscrew look (1) between capscrews and the retainer washer (2). Items (4) to (22) and (35) to (45), inclusive, can be removed as a unit after taking out eight 5/8" capscrews holding the gear box (18) to the carrier (28). The shims (20), (21), and (22) are used to set the gears properly for tooth contact.

# Disassembly of the Belt Pulley - Continued

With the pulley removed, the shaft (11) can be taken out. Remove the capscrews from the bearing cap (45) and the bearing retainer washer (42). Tapped holes are provided in the bearing cage (40) for puller capscrews. The oil seal cage (5) can be removed and the assembly forced out from that side. The gear (35) and spacer (36) can then be lifted from the gear box (18).

The oil seal (8) and felt washer (7) can be taken out of the oil seal cage (5) if their replacement is desirable. The bearing (10) can be pressed from the shaft (11). The shims (37), (38), and (39) are of varying thickness and are used to obtain the proper running clearance or backlash between the gears. Two capscrews in the bearing retainer washer (43) hold the bearing (41) on the shaft (11).

The shifter coupling (58) can be removed by disengaging it from the coupling (55). The shaft (53) can be removed from the carrier (28) after taking the capscrews from the bearing retainer washer (56) and from the bearing retainer (26). Slide the pulley coupling (55) off the forward end of the shaft and push the pinion (25) with bearing (41) out of the rear end of the carrier (28). The bearing (54) can then be removed from the carrier.

The shifter mechanism can be removed after taking the capscrews from the shifter fork (49) and pulling on the shifter lever (50). When the round keys (47) clear the shifter fork, they may be lifted out and the shaft (48) withdrawn from the carrier. The poppet ball (31), poppet spring (32), and the fork (49) can all be taken out of the carrier.

The power take-off can be disassembled after taking off the retainer (60) and the snap ring (7), Illust. 3, from the shaft assembly (2).

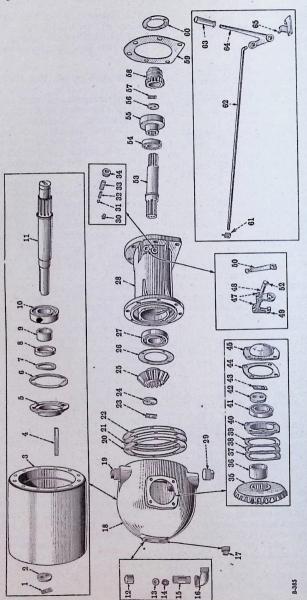
# Reassembly of the Belt Pulley

Reassembly of the units is practically the reverse of the disassembly procedure. Assemble the carrier unit and the gear box units separately. The carrier assembly can be completed by pressing bearings (27) and (54), Illust. 6, on the shaft (53). Put the bearing retainer (26) in position with capscrews in the retainer. Attach the pinion (25) and bolt it secured with retainer washer (24) in place Assemble the shaft unit to the carrier and bolt the bearing retainer (26) to the carrier (28). Then attach the coupling (55) and the bolt or retainer (56).

Place the pulley shaft (11) in the gear box (18). Set the gear (35) over splines of the shaft. Slide on the spacer (36) and press the bearing cage (40) with the bearing (41) into the shaft, using the same number of shims (37), (38), and (39) as were removed. Attach the bearing retainer washer (42) and bolt in place. Then press the bearing cage into the gear box (18). Press the bearing (10) on the shaft (11) and press into position in the gear box. Add the oil seal cage (5) with spacer (9), oil seal (8), felt washer (7), and gasket (6).

Connect the gear box to the carrier with the shims (20), (21), and (22) in place. Test gears for the proper backlash. The heels of the gears should be flush as observed through the opening in the top of the gear box when lighted through the other holes in the gear box. The backlash of the gears should be .004 inch to .008 inch. Rearrange the shims (37), (38), and (39) to obtain this backlash. Reassemble the rest of the parts in the reverse of the disassembly procedure.

Belt Pulley - Continued



Illust. 6

Exploded View of the Belt Pulley Assembly.

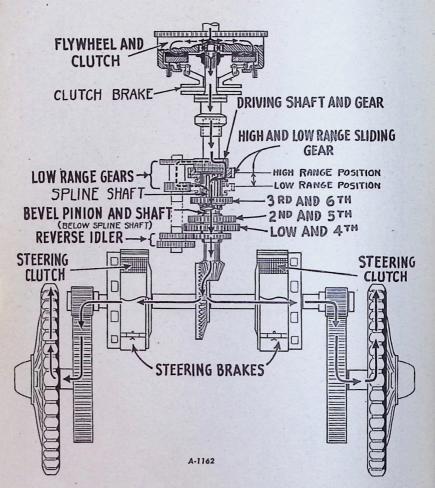
# REPAIR SECTION

# POWER TAKE-OFF - Continued

# Belt Pulley - Continued

Description	Bushing. Hex. jam nut, 3/4" N.C. Gear (24 teath)	Spacer.	Shim, heavy.	Shim, light.	Cage.	Bearing.	washer Took	Gasket.	Cap.	Key.	Fork (use with coupling).	Lever.	Shaft.	Bearing, front.	Masher.	Lock.	Shirter coupling (is teeth).	r.	shifter hand	Belt pulley shifter hand lever handle.	hifter lever	ing block.	Belt pulley shifter lever rod.
Ref.	33 34 35	36	37	39	40	41	4.7 7.4 7.	44	45	47	40	50	53	54	26	57	28	609	64	63	65	10	62
Description .	Lock. Washer. Pullev.	Key.	Cage with felt and seal.	Felt.	Oil seal.	Spacer.	Bearing.	Pipe cap (1").	Felt.	Screen.	Street ell (1").	Pipe plug (i").	Pipe plug (1-1/2").	heav	Shim, medium.	Lock.	Washer.	Pinion (15 teeth).	Retainer.		Pipe plug (1-1/2").		Poppet. Spring.

#### POWER TRAIN



Illust. I

Schematic Drawing Tracing the Line of Power from the Engine through the Engine Clutch, Transmission, Bevel Gear, Steering Clutches, Sprocket Drives, and Sprockets to the Tracks.

# POWER TRAIN - Continued

#### Line of Power

The line of power from the engine is through the flywheel and engine clutch to the transmission and bevel gears. The power is distributed to both sides through the steering clutches to the sprocket drive gears, sprockets, and track chains on each side of the tractor.

The transmission has six forward speeds and two reverse speeds. Standard shifting is controlled by one lever while the change from the high to low range is controlled by another lever. An automatic clutch brake on the engine clutch comes into action to facilitate easy shifting of gears when the shift lever is pushed as far forward as possible. Gears are assembled on three shafts which are mounted in the rear main frame. The bevel pinion and shaft revolve on a straight roller bearing in a bearing cage next to the pinion. Ball bearings take the end thrust and the bearing cage is shimmed from the transmission end cover for come setting of the bevel gear.

The upper shaft or spline shaft revolves in two ball bearings in

No.

cages. It is hollow to allow the power take-off shaft to pass through it, thus driving direct from the drive gear assembly.

The Hi-Lo and reverse gear shaft is stationary in the main frame and the transmission end cover. The reverse gear revolves in two roller bearings and the Hi-Lo range gear revolves on its ball bearings.

The clutch brake operates automatically when the clutch is fully disengaged.

When both steering clutches are engaged, power is equally transmitted to each track. By disengaging one steering clutch all the power is applied to one track. If one steering clutch is disengaged and the steering brake applied or the same side, the tractor pivots on its track. The steering brake is a band around the steering clutch drum and is used only for pivot turns and parking purposes. Disengaging both steering clutches at the same time, or disengaging the engine clutch, stops the tractor.

# REPAIR SECTION

# MEMORANDA

#### STARTING SYSTEM

The International Diesel engine is temporarily converted to a gasoline engine during the starting process. After the engine is operated on gasoline for about a minute the starting mechanism is manually released and the engine operates on Diesel fuel as a full Diesel engine. To start the engine as an ordinary gasoline sparkignition engine, the operator pulls down the speed control lever all the way. This shuts off all Diesel fuel supply to the nozzles from the fuel injection pump.

### Operation

With the speed control lever in the shut-off position, lowering the compression release lever to the gasoline starting position moves the top of lever "D", Illust. 1, to the rear, turns cross shaft "J" in the crankcase which rotates bottom of lever "E" toward the front until it contacts lever "B" at point "X". Lever "E" turns lever "B" until latch "A" drops down behind the notch in lever "B", holding it in that position until changing to Diesel operation. See Insert \*1 In Illust. 1.

As lever "B" starts to turn, rod "G" is raised, rotating lever "V" and shaft "CC" against tension of the spring attached to lever "AA", Illust. 2. The worm gear on shaft "CC" turns the gear on the starting valve shaft, pressing the roller "H" against retainer "I" and opening the starting valve. With this valve open, the compression ratio is reduced for gasoline starting.

As lever "B", Illust. 1, rotates, link "Y" is also advanced to the front. This turns a cam in the carburetor, releasing a spring attached to the float. This allows the needle valve to operate and admit the gasoline from the supply tank.

Lever "V" pushes rod "DD" as it rotates, and this movement to the rear turns a shaft in the air valve housing, Illust. 4. The valve lever (1), Illust. 4. The valve lever (1), Illust. 4, is keyed to the shaft and is turned upward, lifting the air valve from its lower seat. As soon as lever (1) gets beyond the center position, the spring in the air valve housing snaps the valve against its upper seat. The air path is then down through the carburetor (see Service Chart, Section 14), and to the manifold, through the opening formerly covered by the air valve when on its lower seat. The copper contact (3), Illust. 4, attached to valve lever (1) is also lifted off the insulated contact (4), breaking the ground connection to the magneto, allowing it to distribute high-voltage current to the spark plugs.

After starting the engine on gasoline, the compression release lever is raised for the change to Diesel operation. Raising the lever advances the top of lever "D", Illust.

1, to the front, turns cross shaft "J", and rotates lever "E". The upper rounded end of lever "E" contacts latch "A", raising it sufficiently to release lever "B" from the offset in lever "A". Spring tension on lever "AA", Illust.

1, through shaft "CC", lever "V", and rod "G". Lever "B", Itlust.

1, through shaft "CC", lever "V", and rod "G". Lever "B", therefore, snaps completely around until it strikes set screw "R". In so doing, it pulls link "Y" which turns the cam in the carburetor so that it engages the spring on the float, forcing the needle valve down on its seat, and cutting off the gasoline supply.

As rod "G" comes down with lever "B", lever "V" rotates with shaft "CC". The worm gear on the shaft rotates the starting valve shaft and lifts roller "H" off retainer "I", allowing the starting valve spring to snap the valve closed. This increases the compression ratio for Diesel operation by closing off the extra volume chambers in the head.

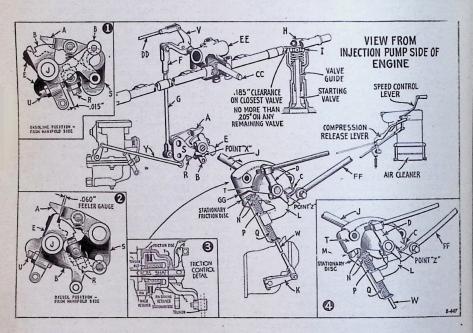
## STARTING SYSTEM - Continued

#### Operation - Continued

As lever "V" is turned, rod "DD" is pushed to the front, turning the shaft in the air valve housing, removing the valve from the upper seat until the spring snaps the valve down against the lower seat.

The air path is now direct to the manifold.

As lever (1), Illust. 4, comes down, contact (3) engages contact (4), grounding the magneto and thereby cutting off the supply of high-voltage current to the spark plugs.



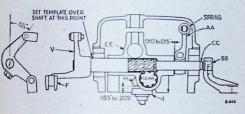
Illust, I Engine Starting Control Mechanism and Governor Friction Control.

# Adjusting Starting Control Mechanism

If engine controls have been removed for any reason, the first thing to do is to assemble all controls, cross shafts and their levers as shown in Illusts. 1 and 2. Do

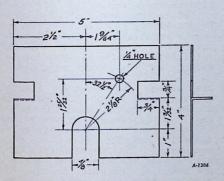
not assemble the intake manifold and valve cover, nor connect yoke "F" to the lever "V". The cross shaft "J" should have .030" end play when checked between lever "D" and bracket "I" (see Insert No. 3, Illust. 1).

## Adjusting Starting Control Mechanism - Continued



Sectional Drawing of Starting Mechanism Cross Shaft.

1. Make a sheet metal template according to the diagram on Illust.3. Slide the template opening over shaft "CC", Illust.2, between lever "V" and the valve housing. Let the prongs rest on top of the valve housing, without its gasket. Insert a 1/4" pin through both lever "V" and the hole in the template to hold lever "V" at 32-1/2 with the vertical.



Illust, 3
Templete for Setting Starting
Cross Shaft for Adjusting Starting
Valve Roller Clearance.

2. The spring on top of lever "AA" holds the roller "H" for each cylinder away from the starting valve

between "H" and "I" should be .185" minimum for each roller and the greatest clearance for any one should be .205".

Place a .185" (3/16") gage under the roller with the least clearance, and adjust set screw "BB" to obtain this setting. The lever "AA" may be moved along shaft "CC" if screw "BB" requires much movement to the right. Replace the cotter key. Adjustments of screw "BB" rotates the starting valve roller shaft when cross shaft "CC" is held from rotating by the pin in lever "V" and the template.

- 3. There should be .010" to .015" clearance between lever "AA" and bracket "EE" after setting the valve clearance.
- 4. Back off set screws on the following levers, Illust. 1: "R" on release lever bracket "S", "C" on cross shaft bracket "T", and "U" on jaw lever "B".
- 5. Set the compression release lever for Diesel operation. Latch "A" should be engaged behind jaw "B". Adjust set screw "R" in bracket "S" for .060" clearance between jaw "B" and latch "A" as shown in Insert No. 2, Illust. 1.
- 6. Holding jaw "B" against set screw "R", adjust yoke "F" on rod "G" so that its pin can be slipped through yoke "F" into lever "V" with ease. Then replace the cotter key in the pin.
- 7. Lower the compression release lever until lever "E", behind jaw "B", contacts the offset pick-up face on lever "B" at the point "X". Now adjust set screw "C", on the opposite side of the engine, to give .100" between set screw "C" and lever "D" at the point "Z".
- 8. Lower the compression release lever to starting position or until latch "A" locks behind the notch in jaw "B" as shown in Insert No. 1, Illust. 1.

#### Adjusting Starting Control Mechanism - Continued

9. Adjust set screw "U" in lever "B" to give a .015" clearance between the set screw and the stop on bracket "S" as shown in Insert No. 1. Lock with the lock nut. This clearance is overtravel of lever "B".

10. Attach the intake manifold to the engine and connect rod "DD" to lever "V". Adjust the yoke on rod "DD" to have the pin in the air valve lever approximately centered in the slot in the end of rod "DD", Illust. 4.

ll. Trip the mechanism to Diesel position and check for the pin centering in slot in rod "DD". Adjust the yoke to obtain the best balance of centering the pin in the slot for both Diesel and gasoline operating positions.

12. Connect link "Y", Illust. 1, between the carburetor and lever "B".

13. Start the engine and run at idle speed on the Diesel cycle. The finger on lever "L" should just contact the spring plunger "M" in bracket "T", (see Insert 4). (On units with a poppet arrangement in place of the plunger "M", the poppet should drop into the hole in the stationary disc of the friction control). If the injection pump has been replaced, lever "K" can be set on the serrations of its shaft to make the engine idle at this position of the controls. Further adjustment can be made by turning nuts "N" on rod "W" until the engine idles when the finger of lever "L" just contacts plunger "M", or the poppet in lever "L" locates in the hole in the stationary disc.

14. Lower the speed control lever all the way for the shut-off posi-

tion of the pump. Plumger "M" should then extend 3/32" from the boss of bracket "T". (On units with a poppet arrangement the lever "L" should be against the bracket "T" at point "GG"). Adjust the yoke on the speed control rod to assure a complete pump shut-off if necessary. Spring "P" should be slightly compressed but not compressed solid. There is always tension on springs "P" and "Q" for cushioning the governor when operating.

15. Operate the engine at full throttle and inspect spring "Q". It too should be slightly compressed at this position. Adjustment of the stop screw on the air cleaner will provide proper tension on the spring.

#### Intake Manifold

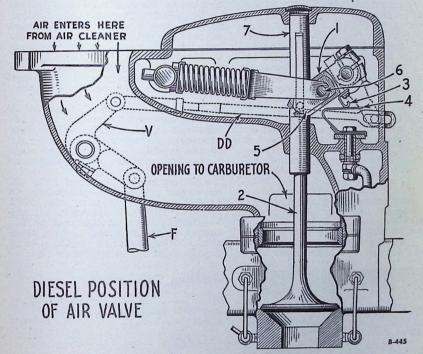
The intake manifold is of the combination type, using a poppet-type valve to bypass air through a gasoline carburetor for starting purposes only. The operation, and adjustments necessary, are described in this section. The manifold assembly as removed from the engine consists of the starting carburetor with primer, the air valve assembly with magneto cut-out switch, and the intake manifold.

The entire unit can be removed after disconnecting the fuel line to the carburetor, removing cotter keys and disconnecting the primer and choke control rods, air valve operating rod "DD", Illust. 1, disconnecting the magneto grounding wire inside the air valve housing, and removing the nuts holding the manifold to the cylinder head, and the air pipe from the air cleaner. Removing four capscrews which hold the carburetor to the manifold and the same number of nuts which hold the air valve assembly to the intake manifold frees the manifold.

#### Intake Manifold - Continued

Since no heat passes the air valve seats, they rarely require reseating. Valves can be re-lapped to the seats by removing the carburetor, controls, and manifold. The air valve should be in the gasoline starting position before starting to work. Take the cover of the

air valve housing and slip the pin retainers (5), Illust. 4, off the ends of the pin in the air valve. Use a screw driver. Next apply the screw driver between pin (6) and lever (1) and push forward sufficiently to relieve tension on the pin in the air valve, and slip out the pin. Lower the lever (1) to a position like that in Illust. 4.



. Illust. 4 Cross Section of the Air Valve Housing on the Intake Manifold.

For lapping the lower seat in the manifold, the air valve housing must be assembled to the manifold. Apply lapping compound through the hole in the manifold, use a suctioncup type driving tool on the valve and hold the valve against the seat with slight pressure exerted on the end of the valve stem inside the valve sleeve (7). The sleeve must

remain assembled during all lapping operations.

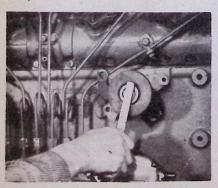
For lapping the upper seat on the insert in the valve housing, remove the manifold and lap by the conventional method. Be sure to clean both parts thoroughly before reassembling.

#### Intake Manifold - Continued

Reverse the disassembly procedure to reassemble. Draw up manifold stud nuts to 75 ft.-lbs. torque. Readjustment of controls will not be necessary.

#### Governor Friction Control

The engine is equipped with a governor friction control. It is composed of the unit located under the cross shaft operating bracket Insert 3, Illust. 1. It prevents the play in the control linkage from interfering with the speed regulation and also holds the governor control lever at the speed selected. The friction unit is ittached to the control lever "L" which turns freely on cross shaft 'J", and is independent of the change-over mechanism. The end of lever "D", however, contacts lever "L" and prevents opening the throttle wide while the engine operates on the gasoline cycle. Two inde-pendent friction discs sandwich a stationary disc that is anchored to the side of the engine crankcase. Insert No. 3, Illust. 1, shows a cross section of this assembly. By removing the taper pin from lever "D", cotter keys from lever "L",



Illust, 5 Increasing Tension on Governor Control Discs.

and three capscrews from bracket "T", the entire assembly can be removed for adjustment of friction to hold the throttle at the position selected.

With the unit off, take out the spring and plunger "M". Reverse the inner assembly on the cross shaft to make adjustment easy (see Illust. 5). Turn the tension nut clockwise to increase the tension on the discs. Two holes are drilled in the tension nut for tightening purposes. A flat tool with two pegs can be used. Proper tension is obtained when a torque of 120 to 130 inch-pounds is required to turn the stationary disc with the control lever "L" held stationary.

Replace the spring and plunger after the bracket and inner assembly are replaced on the shaft and the stationary disc has engaged the pin in the crankcase. Replace the capscrews and connect up the controls.

The adjustment of the controls has not been changed. Referring to Insert No. 3, Illust. 1, the small pin in lever "L" drives the immer retainer. The tension nut is attached to "L", and the spring bears against the retainer holding the friction surfaces together.

#### Starting Carburetor

Type . . . . . . . I.H.C. - C-12
Gasoline Supply . . Gravity
Float Level . . . 1/4" from top
of bowl

Adjustable . . . Yes

The carburetor can be removed from the intake manifold after removing the fuel line, choke control, link and starting system controls, primer controls, and four bolts holding the carburetor to the manifold.

The primer can be unscrewed from the carburetor after the connector nut (11), Illust. 6, is removed from the primer (4), and the inlet tube (9) is withdrawn from the primer. Items (1), (2), (5),

#### Starting Carburetor - Continued

and (6) are attached to the manifold. There are no service operations to be performed on the primer (4). If the primer fails to work, be sure inlet tube (9), and tubes and passages attached to and in the manifold, are all cleaned out before replacing the primer.

The fuel bowl (66) can be removed from the remainder of the assembly by taking out five capscrews. With the bowl inverted, the float (64) should be 1/4" inside the bowl. The float can be removed by withdrawing the float pivot screw (56). The needle valve (57) can be withdrawn from its cage. The cage can be removed with a screw driver or a socket wrench. The screen retainer (69) can be unscrewed from the bowl (66).

The bottom plate (60) can be removed after taking out three capscrews. The metering well (62) can be removed from the bottom plate (60) by applying a wrench to the hex end of the well. The drip hole filler (49) is retained with a plug (50) which has a hole in the center.

The inlet tube (9) for the primer (4) can be removed after unscrewing the tube gland (8) from the body (43). The cam (53) for locking the float valve on its seat can be removed after taking the nut (55) from the end of the control shaft (34). The shaft (34) can be withdrawn from the body (43) with the

dust washer (39), retainer (40), and spring (41). The shaft bearing (38) can be unscrewed from the body (43). The butterfly (31) can be removed after taking out the two screws (23). The removal of the shaft (24) then requires removing the clamp screw (28), cover (26), and the screw in the spring end (70).

The choke valve or shutter assembly (22) can be removed after removing the butterfly screws (21). The shaft (14) with attaching parts can then be removed.

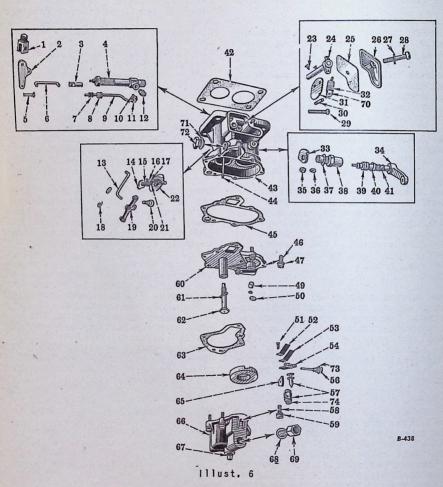
Reassembly of the starting carburetor is the reverse of the disassembly procedure. Bend the float lever (54) to make the float rest 1/4" inside the bowl when the bowl assembly is inverted.

After replacing the carburetor on the manifold, start the engine and adjust the engine speed with stop screw (29) as outlined in the "Operations Section". With the exception of adjusting the engine speed, adjusting the float level, and thoroughly cleaning the carburetor of all gums, there should never be any occasion to disassemble the unit.

### Spark Plugs

The gap should be .035" to .040". Clean or adjust the spark plug gap at least every 200 to 300 hours. Use a sand-blasting method of cleaning whenever possible. Check the gap when hard starting is encountered.

### Carburetor



Exploded View of the Carburetor for Starting the TD-18 Diesel Engine.

### Carburetor - Continued

Ref.	Description	Ref. No.	Description
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 30 30 30 30 30 30 30 30 30 30 30 30	Bell crank support. Bell crank. Rod end. Primer assembly. Pin. Rod. Tube packing. Tube gland. Inlet tube. Connector sleeve. Connector nut. Inlet valve. Connecting rod. Shaft and lever assembly. Packing spring. Retainer. Packing. Washer. Bell crank. Screw. Butterfly screw. Shutter assembly. Butterfly screw. Throttle shaft assembly. Gasket. Cover. Screw gasket. Clamp screw. Stop pin. Butterfly. Spring. Cam. Shaft and lever assembly. Type "B" hex. nut, No. 8 - 32. Lock washer for No. 8 screw.	38 39 40 41 42 43 44 45 46 47 49 50 51 52 53 54 60 61 62 63 64 66 67 68 69 71 72 73	Shaft bearing. Dust washer. Retainer. Spring. Gasket. Body. Tube. Gasket. Lock washer for No. 12 screw. Screw, No. 12 - 24 x 3/4". Drip hole filler. Plug. Screw, No. 4 - 36 x 7/16". Spring, upper leaf. Spring, lower leaf. Float lever. Float pivot screw. Valve cage assembly. Screw, No. 12 - 24 x 1". Lock washer for No. 12 screw. Bottom plate. Gasket. Float with ferrule. Plate. Fuel bowl. Steel pipe plug, 1/8". Strainer screen gasket. Screen retainer. Spring end. Plug gasket. Plug. Float lever pivot screw gasket.

## STEERING MECHANISM

#### STEERING MECHANISM

#### Steering Clutches

There are two 15-inch multiple drydisc, spring-loaded type steering clutches. They are located in separate compartments, one on each side of the bevel gear compartment at the rear of the main frame. They can be removed individually with their release mechanism without disturbing the bevel pinion adjustment or sprocket drive assembly.

#### Removal of the Steering Clutches

- To remove either steering clutch proceed as follows:
- 1. Drain oil from the transmission.
- 2. Remove the seat frame, fenders, fuel tank, batteries, and supports, being sure to disconnect the fuel lines and electric wiring.
- the two inspection covers and the clutch lubricator grease tube fitting bolts; the springs, capscrews, retainers, and levers on top of the release forks; the transmission igear shifter housing; and capscrews and dowel pins.
- .4. Remove the main frame cover.
- 15. Tap the bearing cage (23), Il-Ilust 1, from the release fork (24).
- 66. Loosen the brake band adjuster and take out the cotter key and pin ifrom the steering brake band at the irear.
- 77. Remove the grease tubes (14) and (26), connected to the release collar (30), and the release fork llower bearing (27).
- 88. Remove the upper pin (29) from the release fork (24) by taking out the lower cotter key. Then turn the fork and lift the upper link (28) from the release collar (30).

- 9. Remove the <u>lower</u> pin (29), from the release fork by taking out the upper cotter key. Push the pin down to free the link. Turn the release fork and remove the <u>lower</u> link (28) from the release collar.
- 10. Lift out the release fork (24).
- 11. Remove the capscrews from the bearing cage cap (4), and slide the cap into the steering clutch.
- 12. Remove the two diametrically opposite capscrews (53), Illust. 2, from the hub plate (33). Assemble the clutch compressor angle tool with two 5/8" N.C. x 1-1/2" and two 1/2" N.C. x 2-1/4" bolts. Turn in the bolts as far as possible to compress the spring (38) and disengage the steering clutch. The spring retainer (37) will move in until it contacts the hub (39) after approximately 1/2" travel.
- 13. Bend back the locks and remove the special capscrews (8) from the clutch coupling (1). Turn the bevel gear to make all capscrews accessible.
- 14. Remove capscrews from the steering clutch drum (43) at the sprocket drive pinion flange (51). Revolve the drum with a bar to make all capscrews accessible. Mark the relative position of the drum on the flange so that the grease tube lines up with the notch at the center of the flange when reassembling. Capscrews are not all evenly spaced around the drum.
- 15. Put a sling on the clutch drum, pry the coupling (1) into the bearing cage cap (4), knock the assembly off the flange (51), and lift out.

#### Replacement of the Steering Clutches

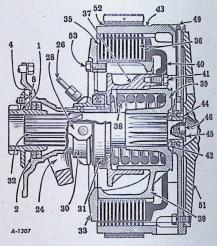
Steering clutches can be replaced by reversing the above procedure.

The bearing cage cap gasket (3), Illust. 1, should be attached to the main frame before installing the clutch; the gasket is more easily protected from damage by doing this. Then compress the clutch as far as possible. Be sure that the socket head bolt (46) in the steering clutch shaft (32) is tight. The pin (47) in the retainer (45) fits into the drum (43) to keep the inner race of the bearing (44) from revolving on the shaft. It also maintains bolt tension.

The bearing cage cap (4) and coupling (1), Illust. 2, can be slid off the shaft to replace the double leather oil seal (2). Always install a new seal. A handy driver for this seal is provided by the coupling. Assemble the coupling bolts (8) to the coupling and slide the oil seal onto the coupling with the lips of the seal toward the flange of the coupling. Then use this assembly to press or drive the oil seal into the bearing cage cap (4). Be sure that the seal bottoms in the counterbore of the bearing cap.

Lubricate the finished surface of the bearing cage cap and slide the assembly onto the clutch shaft (32) together with the release collar (30) and the release bearing (31). Be sure that the collar slides freely on the cap.

Use several capscrews to draw the steering clutch drum (43) onto the flange of the sprocket drive pinion shaft (51) before centering the coupling (1) and prying it into the hub of the bevel gear. Then insert the coupling bolts (8) (punchmarked for identification) and lock them for tightening.



Illust. 2 Cross Section of Steering Clutch Assembly.

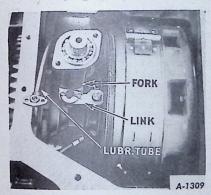
1. Clutch Coupling; 2. Bearing Cage Cap Oil Seals; 4. Bearing Cage Cap; 8. Clutch Coupling Bolt; 14. lease Fork Bearing Grease Tube; 24. Release Fork; 28. Release Collar Clutch Release Shifter Link; 30. Clutch Release Collar; 31. Clutch Release Bearing; 32. Clutch Shaft; 33. Hub Plate; 35. Clutch Disc, External Teeth; Clutch Disc, Internal Teeth; 36. Spring Retainer; 38. Spring; 37. 39. Hub; 40. Pressure Plate; Bolt; Plate Dowel Pressure Bearing Spacer; 43. Clutch Drum; 44. Pilot Bearing; 45. Pilot Bear-ing Retainer; 46. Pilot Bearing Retainer Bolt; 48. Pilot Bearing Lubricator Pipe; 51. Sprocket Drive Pinion Shaft; 52, Steering Brake Band; 53. Hub Plate Bolt.

## Replacement of the Steering Clutches - Continued

After assembling links (28) Illust. 1, to the release fork (24) and the release collar (30), the cotter keys previously removed can be replaced (see Illust. 3). Turn the fork to one side and spread one side of the key with a long screw driver or rod inserted through hand holes in the rear of the main frame.

Lubricate the pins of the release collar and release fork before replacing the main frame cover.

The clutches can be adjusted according to instructions in the "Operations Section".



View Looking from the Front of the Left Steering Clutch, Assembled.

#### Replacement of the Discs

With the clutch removed from the tractor the discs can be removed.

1. Assemble 1/2" capscrews to the three tapped holes in the pressure plate (40), Illust. 1. The clutch can be compressed by turning these capscrews in.

2. If compressor angle tools have been used, they should be removed after turning the capscrews all the way in. On a clutch without the compressor tool assembled, the use of capscrews in the pressure plate (40) forces the plate to the right of the hub (39), Illust. 2, or compresses the spring (38), or the pressure plate (40) moves while the hub holds its position on the shaft (32).

3. Now remove capscrews (52) from the hub plate (33) and lift it off.

4. The discs with internal teeth (36), and those with external teeth (35) can now be removed from the hub and the drum.

5. The drum (43) and shaft (32) can be removed from the assembly consisting of the hub (39), pressure plate (40), spring retainer (37), and the spring (38).

6. Remove the socket head bolt (46), the retainer (45), and slide the shaft (32) out of bearing (31).

7. The bearing with its snap ring can be removed from the drum.

8. The spring (38) can be removed by holding the assembly with an arbor press, removing capscrews from the tapped holes of the pressure plate (40) and the three capscrews (41) holding the pressure plate (40) to the three prongs of the spring retainer (37).

9. The free length of the clutch spring is 8-13/16". The spring should rest evenly in both the retainer and the hub. The inside of the hub should show no marks caused by the spring binding on its sides.

10. The outside surface of the hub (39) which contacts the retainer should be smooth so that the retainer (37) will slide freely on the hub (39). If the hub shows marks from binding in the retainer (37), assemble two capscrews to the retainer and pressure plate (40). The third hole in the pressure plate should line up perfectly with the third tapped hole in the retainer (37). Any force used to remove the third bolt will cause the retainer to bind on the hub.

#### Replacement of the Discs - Continued

11. When assembling the retainer (37), the spring (38), the hub (39), and the pressure plate (40), arrange the pressure plate on the hub so that the prongs of the retainer are centered in the holes of the hub. There should be 5/32" to 7/32" radial clearance.

12. The teeth on the hub, drum, and pressure plate should be smooth, as well as all surfaces of the internal and external teeth discs.

13. The assembled clutch should run true, and the outside diameter of the coupling (1) should be concentric with the outside diameter of the drum (43).

After assembling dowel pins to the main frame cover, place the release lever on the shaft of the release fork and check the free travel of the clutch for any possible binding of parts. Adjust the levers as outlined in the "Operations Section".

#### Steering Brakes

A steering brake is provided for each steering clutch. Its purpose is to stop the clutch drum from rotating after the steering clutch has been disengaged. Depressing one brake locks the track on that side and forms a pivot point for short turns. The brakes can also be used for parking purposes. Each can be locked in position. Pedals for each brake are adjustable to suit the operator. The brakes are simple and readily accessible, contracting on the steering clutch drums.

The bands can be relined after removing them through convenient holes in the bottom of the main frame. No other part of the tractor need be removed.

## Replacement of Brake Linings

Release the tension on the hand adjusting knob (16), Illust. 4.

Then remove the hand hole covers from the bottom of the steering clutch compartments. Unhook the anchor spring (26) from the brake band and turn out set screw (28). Turn out the adjuster bolt (22) to free the band. Remove the cotter key and pin (24) from the linkage.

Take out the shaft stud (42) from the center end of the pivot shaft (43) and work the shaft to the side to free the pivot lever (23). Use a screwdriver in the notches in shaft (43). Pull down on the pivot lever (23) to slide the band from around the brake drum.

Reline the bands, being sure to countersink the rivets well.

The bands can be replaced in the tractor by reversing the above procedure.

#### Replacement of Main Frame Brake Shaft Bushings

To replace these bushings, (5) and (19), Illust. 1, Section 6, remove the outer rod (7) Illust. 4, from the lever (34).

Remove the main frame cover. Attach a wire to the spring (31), and disconnect it from the anchor (45) and the inner rod (25). A hole is provided inside the main frame through which the lock bolt in the inner lever (33) can be removed. Then pull out the outer lever (34).

Knock out caps (6) and (20), Illust.

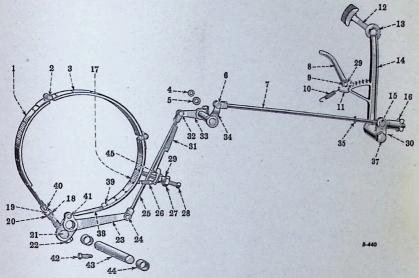
1. Section 6, on the side of the main frame and drive out the bushings (5) and (19).

The dust seals (5), Illust. 4, in the main frame can be replaced.

Replace the bushings and press them in. The brake shaft bushings are furnished reamed to size.

The remaining steering brake assembly can be removed as previously described after which the pivot lever (23), Illust. 4, brake rod (25), and brake rod lever (33) can be pulled out through the bottom of the main frame.

## Steering Brakes and Controls



Illust. 4 Steering Brake Assembly, Complete.

Ref.	Description	Ref.	Description
12 13 14 15 16 17 18	Band, rear. Pin. Band, center. Key for lever; inner. Seal. Rod pin. Rod, outer. Pawl. Pawl stud. Pawl spring. Pawl link. Pedal pad. Swivel. Pedal. Pivot pin. Adjusting knob. Brake band lining. Washer. Hex. nut, 5/8" N.F. Spring. Pin. Bolt.	23 24 25 26 27 28 29 30 31 32 34 37 38 39 40 41 42 43 44 45	Lever. Pin. Rod, inner. Anchor spring with hook. Nut, 5/8" N.C. Set screw. Lock washer, 1". Pedal shaft lubricator. Release spring. Pin, upper. Lever, inner. Lever, outer. Washer. Pedal shaft. Band, front. Lining rivet. Adjusting bolt spacer. Pin. Shaft stud. Pivot shaft. Bushing. Anchor.

## REPAIR SECTION

## MEMORANDA

#### TRACK

#### Track Chain

The track links are drop-forged, heat-treated steel. The track pins and bushings are machined, carburized, hardened steel forced into the links under great pressure. The pins move freely in the bushings but the ends are a press fit in the links. The left and right tracks are interchangeable.

#### Removal of the Track Chain

The track chains are easily removed. Each chain has a master pin identified by a locking wire. Have this pin at the front for easy removal. Take out the wire and drive the pin out of the links. Then back up the tractor to shed the track.

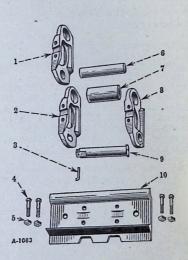
#### Replacement of the Track Chain

Lay the replacement track in line with the track being removed. Have the link without the bushing toward the tractor. Run the tractor forward on the new track. Then pick up the end of the new track and engage the bushings in the sprocket teeth. Guide the track around the sprocket and over the idlers as the tractor moves ahead. Line up the link and the bushing with a bar. Install the master pin and replace the lock wire.

#### Repair of the Track

Worn parts can be replaced by one of two methods, both of which require a hydraulic press with a special adapter head and fittings. The pin diameter is 1.622-inch to 1.625-inch and the clearance is .005-inch to .020-inch.

The track can be repaired when the shoes are on the chain or off the chain.



Exploded View of Track Link, Pin and Shoe Assembly.

Ref.	Description		
1	Link, right hand.		
2 3	Master link.		
3	Lock wire.		
4	Cap screw.		
4 5	Nut.		
6	Pin.		
7	Bushing.		
8	Link, left hand.		
9	Master link pin.		
10	Track shoe.		

The following procedure should be followed when the track shoes are assembled to the track:

Remove the track chain. Then press pin (6), Illust. 1, all the way out of each link which needs repairing,

## Repair of the Track - Continued

replacement, or reboring. Drive the old bushing (7) out and the new bushing in during the same operation when a bushing needs replacement. Place the links in relation to the track and push the pin (6) into the assembly joining the links into a chain. If link (1) or (8) needs replacement, push out the old bushing only. Then the link can be replaced.

To repair the track when the shoes are removed from the chain, follow this procedure:

Remove the track chain. Push pin (6) just out of the "first link" (8). NOTE: Carry each of the operations to completion for the entire length of the track to be repaired before proceeding to the rest of the operation.

The words "first link" imply that link (8) is removed separately.

The words "second link" imply that link (1) is removed with one pin (6) and one bushing (7) assembled to it.

Push the bushing (7) just out of the "first link" (8). After the pin and the bushing are out of the "first link", the sections of the track being repaired are composed of several loose links (8) and several three-piece assemblies (1), (6), and (7) consisting of one link (1), one track pin (6), and one bushing (7). These assemblies can be separated from the chain by sliding the pin out of the next bushing.

The following steps pertain to the dismantling of these three-piece

assemblies, and reassembling them with new pins and new bushings.

Push bushing (7) out of the "second link". Push pin (6) out of the "second link". Push the new bushing (8) into the "second link".

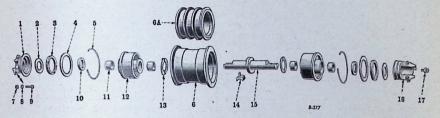
Then push new pin (6) into the "second link". Push bushing (7) into the "first link" (1) while assembling the section of the track to the track chain. Then push the pin into the "first link".

#### Track Rollers

Five track rollers on each side carry the weight of the tractor. These rollers are welded, heattreated, steel-forged fittings with special alloy carriers with four bronze bushings which rotate on heat-treated steel shafts. They are effectively sealed at each end by three individual washers and a spring-loaded, double-leather seal with the lips of the seal turned out. The rollers are gravity-lubricated at low turning speeds and pressure-lubricated at high speeds.

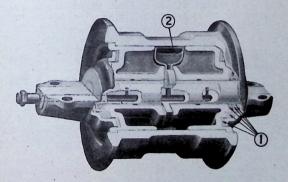
The rollers can be removed with or without removing the track chain. One of the easier and faster methods of removing all rollers is to remove the track chain but do not run off the track. Take out the two bolts in the front idler adjuster and slide the front idler assembly off the track frame. Then take off the track roller shields. Take out all bolts in the track roller brackets, jack up the track frame at the front, and slide all the rollers out the front of the track.

#### Track Rollers - Continued



Illust. 2 Exploded View of the Track Roller.

Ref.	Description	Ref.	Description
1 2 3 4 5 6 7 8	Bracket (inner). Felt washer, outer. Felt washer, center. Cork washer, inner. Snap ring. [Roller (double flange). Roller (single flange). Nut, 5/8" N.F. Lock washer, 5/8".	9 10 11 12 13 14 15 16 17	Bolt. Oil seal. Carrier bushing (set). Carrier (set). Thrust washer (set). Oil scupper. Shaft. Bracket, outer. Lubricator.



Illust. 3 Cross Section of Track Roller.

 Five Oil Seals; 2. Oil Scupper for Pressure Lubricator.

#### Disassembly of the Track Rollers

The inner (1) and outer (16) brackets, Illust. 2, can be slipped from the shaft (15). The outer felts (2), center felts (3), and corks (4) can also be removed. Then pry out the snap rings (5).

Place the roller (6) in an arbor press; by forcing out the shaft (15), one carrier (12) will come out of the roller. Then the other carrier can be forced from the roller. The shaft (15) can be lifted out of the carrier (12) and the oil scupper (14) can be removed.

The thrust washers (13) should be replaced if they are damaged or worn.

The carrier bushings (11) are replaceable, reamed to size, and need only be pressed in place, bevel first, until they are flush with the face of the carrier (12). Be sure all the oil holes are clean.

#### Reassembly of the Track Rollers

With the aid of an arbor press, force one carrier (12) into the roller (6) until the flange of the carrier bottoms in the counterbore of the roller. Then insert the snap ring (5).

Place one thrust washer (13) in the carrier assembly, being sure that the lugs of the thrust washer engage the slots provided in the carrier.

With the oil scupper (14) inserted in the shaft (15), replace the shaft in the carrier roller assembly. With the other thrust washer in place, line up the lugs of the washer with the slots of the second carrier and put the second carrier in place until it bottoms in the counterbore. Then replace the second snap ring (5).

Slots in the carrier (12) may be lined up with the lugs on the washers (13) by holding the shaft (15) against the carrier as it is being pressed into the roller.

Replace new oil seals (10) in the carriers. The lips of the oil seals must face away from the center of the shaft. Assemble the felt washers (2) and (3) (saturated with oil) and the cork washers (4) to the carrier. Brackets (1) and (16) can then be replaced, as can the lubricator (17). The entire roller assembly can then be replaced on the tractor.

#### Track Idler

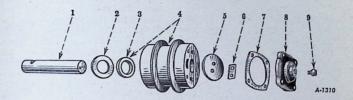
The upper section of the track between the sprocket and the front idler is supported by two greyiron idlers with shielded outer faces (increased hardness). They are mounted on brackets extending upward from the track frame. The idlers revolve on heat-treated, replaceable steel shafts which are locked in the brackets with bolts. A felt washer and spring-loaded teather seal with the lip turned toward the tractor are located in the bracket and idler respectively.

Each idler can be removed by blocking up the track chain, taking out the cap screws in the cover and those holding the retainer washer to the shaft. Removing the bolt from the bracket frees the shaft.

### Disassembly of the Track Idler

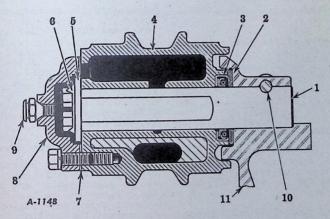
Take out the cap screws from cap (8), Illusts. 4 and 5, to remove the cap and gasket (7). Bend back the lock (6) and remove the two cap screws to release the washer (5). Then the idler (4) with the seal (3) can be pulled off the shaft (1). Washer (2) is then removed. If necessary, the bolt may be removed from the shaft, and the shaft driven from the spring guide or retainer.

#### Track Idler - Continued



Illust. 4 Exploded View of the Track Idler.

Ref. No.	Description	Ref.	Description
1 2 3 4 5 6	Shaft. Washer. Seal. Idler and seal. Washer. Lock.	7 8 9 10 11	Gasket. Cap. Lubricator. Retainer bolt. Support.



Illust. 5 Cross Section of Track Idler.

#### Reassembly of the Track Idlers

The reassembly of the idlers is the reverse of disassembly. Be sure to use a new oil seal (3) with the lip of the seal facing the tractor. Be sure that the lubricator (9) is clean when replaced.

#### Front Idler

Front idlers for the track chains are slide-mounted to the track frames. Tension on the track chains is adjustable at the idler slide mount or guide. Two heavy coil springs on top of the track frame as shown in Illust. 4, "Frame" Section 6, permit the idlers to recoil under shock but exert no tension on the track when in the normal operating position.

#### Removal of the Front Idlers

It is not necessary to remove the track frame assembly to take off the front idlers. Remove the track chain. Then remove the cap screws from the adjuster (15), Illusts. 6 and 7, and slide the entire front idler assembly off the tractor frame.

#### Disassembly of the Front Idler

Both retainers (4) can be removed if necessary for replacement by bending back lock (5) and taking out the cap screws. Bend back the nut locks (2) on both sides and unscrew nuts (1) and (18). The nut for the lubricator should always be placed on the outside.

Take out the four bolts (16) to remove the cross plate (17). The inner and outer guides (3) then may be removed to slide off shaft (13).

Remove key (12). Take off the carriers (8) from the idler (11).

When one of the carriers is removed, the shaft (13) slides out. Then the second carrier can be removed. The shaft diameter is 2.243-inch to 2.244-inch. The bushings are replaceable, reamed to size. They should be pressed into the idler, bevel first, until they are flush with the inside diameter. Clearance is normally .005-inch to .008-inch.

The seal (6) and washer (7) can then be removed from the carriers (8). When replaced, the seals (6) must have the leather lip facing toward the center of the idler (11). The thrust washer (10) can be removed from the carriers (8). In replacing the thrust washers, have the projections engage the slots in the carriers and be sure the surfaces are clean.

The lubricator (14) can be unscrewed from shaft (13). Before reassembling, make sure that the drilled holes for lubrication are clean.

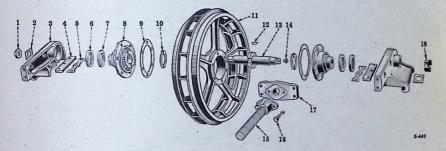
### Reassembly of the Front Idler

Reassembly is the reverse of disassembly. Be sure that the seals (6) have the leather lip facing toward the center of the idler (11). The thrust washers (10) must engage the slots in the carriers. Be sure the surfaces are clean. Before reassembling the lubricator (14) to the shaft, be sure that the drilled holes for lubrication are clean. Be sure to use new washers (7) and new seals (6).

### Replacement of the Front Idler

Replacement on the tractor is the reverse of removal. Be sure the proper adjustments are made after the idlers are on the tractor to the team from cocking and also to prevent the tractor from creeping to one side.

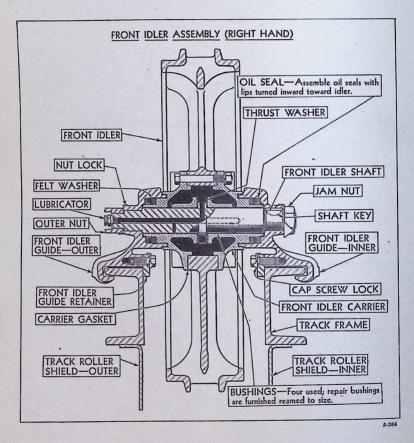
### Front Idler - Continued



Illust. 6
Exploded View of Front Idler.

Ref.	Description	Ref.	Description
1 2 3 4 5 6 7 8 9	Hex. jam nut, 1-1/2" N.F. Nut lock. Guide, inner and outer. Retainer. Lock. Seal. Washer. Carrier. Gasket.	10 11 12 13 14 15 16 17 18	Thrust washers(set of two). Idler. Key (Woodruff No. G). Shaft. Lubricator. Adjuster. Bolt, 5/8 x 1-1/2" N.F. Cross plate. Nut, outer.

#### Front Idler - Continued



Illust. 7 Cross Section of Front Idler.

#### TRANSMISSION

Gear	М.Р.Н.	F.P.M.	Gear Ratio
1	1.5	132	80.0 to 1
2	2	176	60.3 to 1
3	2.3	220	48.8 to 1
4	3.3	290	37.1 to 1
5	4.6	405	26.6 to 1
6	5.7	502	21.5 to 1
Low Reverse	1.5	132	84.0 to 1
High Reverse	3.3	290	37.1 to 1

The transmission is of the selective, spur-gear type, having six forward speeds and two reverse Standard shifting is conspeeds. trolled by one lever, while the change from the high to the low range is controlled by another lever. The gears are assembled on three shafts which are mounted in the rear main frame.

The upper spline shaft (55) Illust.

1, revolves on two ball bearings in cages. It is hollow to allow the power take-off shaft to pass through it, thus permitting the power take-off to drive direct from the drive gear assembly.

The bevel gear and pinion shaft (87) revolves on a straight roller bearing in a bearing cage next to the pinion. Ball bearings take the end thrust and the bearing cage is shimmed from the transmission end cover for the cone setting of the bevel gear. The Hi-Lo and reverse idler shaft (61) is stationary in the main frame and the transmission end cover.

The reverse idler gear revoles on two roller bearings as does the Hi-Lo gear. The rear bearing is a double-row ball bearing.

The Line of Power, Illust. 1, Section 9, shows the flow of power through the transmission.

Service Chart, Section 14, shows the relation of the parts and the procedure for removal.

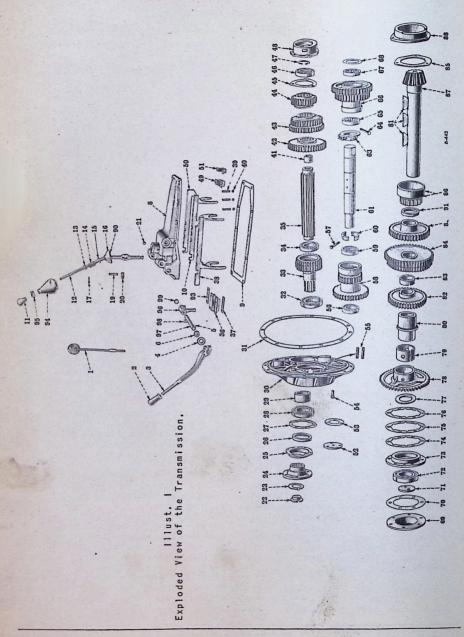
Splash lubrication is provided from the constant running oil gear. The reservoir capacity is 7-1/2 gallons.

#### Preparation for Removal of the Transmission

Remove the seat cushions and battery covers. Remove the braided ground cable from the positive terminal of the left battery. connect the cable between the battery, starting with the terminal right battery. Then remove the cables from the negative terminals of both batteries. The battery supports are spring-mounted and can be readily taken out when the batteries are removed.

The fuel tank and complete seat can be removed as a unit. Take off the fender brackets.

The main frame cover comes off after the following steps have been accomplished. Remove the capscrews from around the outside edge of the main frame cover. Disconnect the electrical wiring and label all of the wires for easy replacement. Refer to the wiring diagrams in the "Parts List".



Description	Washer. Bevel pinion shaft bearing, front. Bearing cage, front. Shim, heavy. Shim, medium. Shim, light. Spacer, front. Gear (47 teeth). Bushing. Sleeve. Key. Gear (39 teeth). Spacer. Gear (45 and 49 teeth). Retainer, rear. Bearing. Pinion and shaft (with drive bevel gear). Pearing cage, rear. Gear (45 und shaft (with drive bevel gear). Bearing. Finion and shaft (with drive bevel gear). Gear (45 und shaft (with drive bevel gear). Gear (45 und shaft (with drive bevel gear). Gear shifter rail guide front bolt lock, left hand. Gear shifter boot clamp. Hillo gear shifter arm. Hillo gear shifter arm. Hillo gear shifter arm.	Hi-lo gear suifter arm shaft plug.
Ref.	177 777 777 777 777 777 777 777 777 777	66
Description	Shift rail. Spring. Gear Shifter rail Poppet ball. Bushing. Gear (42 teeth). Gear (53 and 44 teeth). Gear (57 reeth). Retainer, rear. Bearing. Ring. Look. Low and reverse shift rail. Lock. Retainer. Gasket. Pin. Stud. Bearing. Hilo idler gear (23 and 56 teeth). Idler shaft. Oil scoop. Bearing. Geeth). Bearing. Hilo idler gear (23 and 56 teeth). Bearing. Retainer bolt. Coop. Bearing. Retainer bolt. Hilo idler gear (23 and 56 teeth). Bearing. Reverse idler gear (51 Bearing. Bearing.	Washer. Retainer, front. Gasket.
Ref.	8000 10004000000000000000000000000000000	70
Description	Oil level rod. Handle. Washer. Key (Woodruff No. 9). Seal. Housing. Gasket. Second and third shift rail. Lever ball. Lever with ball. Stop, upper. Spring. Shield. Shi	Spline shaft. Guide, front. Lock, right hand.
Ref. No.	100040000 112242222000000000000000000000	35 36 37

## Preparation for Removal of the Transmission - Continued

Remove the two small inspection covers to take out the bolts which hold the steering clutch grease tubes. Remove the springs, capscrews, and bolts from the steering clutch release levers. Then remove the capscrews from the steering clutch release-fork bearing retainer. Lift the levers and the retainer off the tractor.

Take out the capscrews holding the shifter housing (8) to the main frame cover. Lift the housing assembly with the gasket (9) from the cover. Three dowel pins line up the cover on the main frame and are removed with the aid of a nut on their threaded top. When the pins are out, the main frame cover can be lifted off. If the steering clutch release-fork bearing cages stick in the cover they can be tapped out of place and set back on the release forks.

The engine clutch must be removed before the transmission is removed. This is covered in Section 4.

The rear power take off is removed as described in Section 8.

Removal and Disassembly of the Transmission

Drain the oil from the transmission.

The transmission front cover (30) Illust, 1, is removed through the engine clutch compartment. Bend back lock (23) and remove the special nut (22) in the end of the transmission drive shaft (33). Slide the flange (24) from the shaft (33).

Remove the capscrews from around the outside edge of the front end cover. The bearing retainer (69), for the bevel gear and pinion shaft (87), comes out after removing the capscrews. Then take the capscrews from the bearing retainer washer (71) for the bevel gear and pinion shaft. The retainer (52) for the idler shaft (61) should then be removed. Three dowel pins (54) in the cover (30) have threaded heads for easy removal. Assemble three puller capscrews to the tapped holes in the cover (30). Run them up evenly and lift out the cover assembly (25) to (34) and (72) to (76). The gasket (31) will ordinarily stick to the cover.

To disassemble the drive shaft (33) from the cover, remove the bearing retainer (25). Use a babbitt hammer and drive the shaft (33) to the rear of the cover. Bearings (28) and (32) and the spacer (29) can then be removed from the cover. The bearing cage (73) for the bearing cage (73) for the bevel gear and pinion shaft (87) can then be taken out of the cover. Shims (74), (75), and (76) fit between this bearing cage and the cover, and are used for obtaining the proper tooth setting of the pinion shaft with the ring gear. Bearing (72) can then be removed from the cage (73).

With the cover (30) removed, the front spacer (77) can be lifted off the pinion shaft (87). The gear (78) can also be slid off sleeve (80).

Then remove the capscrews from the rear bearing cage (48). The upper spline shaft (35) with gears (42), (43), and (44), and the bearing (46), can then be pulled out as an assembly. The gears can then be slid from the shaft. Removal of the snap ring (47) permits bearing (46) and the rear retainer (45) to be removed from the shaft. The bushing (41) can be removed if necessary for replacement.

## Removal and Disassembly of the Transmission - Continued

The idler shaft assembly (61) comes out easy. Remove the nut, bolt, and the rear bearing retainer (60). Push the Hi-Lo gear (58) to the rear. Pry behind the reverse idler gear (66) and the entire assembly can be moved forward out of the main frame. The Hi-Lo gear can then be removed from the idler shaft. The bearings (56) and (59) can be removed from the gear if they are to be replaced.

Remove bolt (64) from the oil scoop (63) and pull the assembly (63) and (68) from the shaft. This will free bearings (65) and (67). The bevel gear and pinion shaft (87) can be removed after taking out the capscrews in the rear bearing cage (88). The sleeve (80) can be pulled off the shaft. Gears are keyed and pressed on the shaft and can be removed with the aid of an arbor press. The bearing (86), retainer (85), and the bearing cage (88) will then come off. The spacer (83) is used between the gears (82) and (84). The spacer (91) fits between the gear (89) and the bearing (86).

Shifter gears (42), (43), and (44) operating on the upper spline shaft (35) should be free enough to slide along the shaft but should not have any perceptible play in the direction of rotation. A good fit between the spline of the gears and that of the shaft is important.

Shifter forks attached to the shifter housing (8) can be removed for replacement. This can be done by removing bolts from the shifter rail guides (36) and (49). Both poppets and springs (40) and (39) are freed from the housing (8). The Hi-Lo shifter lever shaft assembly can be removed by taking out the bolt in the lever, pulling off the lever and pushing the shaft into the housing (8). Replace the seal (6). The lever (12) can be removed by taking plugs (21) from the housing (8) and pushing the pin (19) out of the housing.

## Reassembly and Replacement of the Transmission

Reassembly and replacement of the transmission shafts and gears can be accomplished by reversing the disassembly procedure. Use all new gaskets and oil seals when doing so. Thoroughly clean the assembly and the case before replacing the main frame cover. Refer to the "Service Chart", Section 14, for the relative positions of the gears.

Replace the oil seal (26), Illust. 1 when reassembling, being sure to have the lip of the leather seal facing the transmission gears.

Replacement bushing (79) for the gear (78) is furnished reamed to size and need only be pressed into place. The inside diameter of the bushing is 3.523" to 3.527", giving a .003" to .008" clearance. The bushing (41) can be removed for replacement. This is furnished to size and need only be pressed into place. The bushing diameter is 1.640" to 1.642".

When replacing the idler shaft (61), be sure that the tang of washer (68) enters the small hole in the main frame. The bevel gear and pinion shaft (87) are properly located in the main frame from from to rear when a 3/8" (.625") gage will slide free between the end of the pinion and the ring gear hub. Shims (74), (75), and (76) are used to obtain this setting. Remove the shims between the bearing cage (73) and the front end cover (30) to reduce the gap between the end of the pinion and the ring gear hub.

After properly setting the pinion, draw all the capscrews tight and recheck. Then check the gears for backlash and adjust them as outlined under the heading "Drive Bevel Gear", Section 5.

Replace all other items previously removed.

## REPAIR SECTION

## MEMORANDA

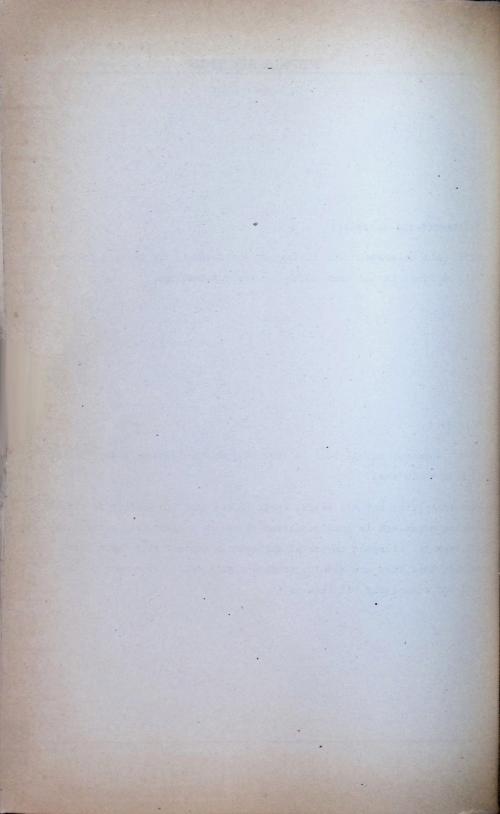
#### TOLERANCES AND CLEARANCES

NOTE: All tolerances and clearances not found in the Service Charts will be found in the text under the various headings.

#### OIL SEALS

NOTE: Whenever an oil seal is removed from the tractor, always replace it with a new seal.

When installing new oil seals, check to see that the leather is pliable and the edges are in good condition to assure a tight fit, preventing oil leakage. Inspect the metal surfaces in contact with the oil seal to make sure they are smooth; roughness will cause rapid wear of the seal and consequent oil leakage.



# TracTracTor Model TD-18

# SPARE PARTS CATALOG

The major units of the tractor are arranged alphabetically, in sections, in this parts list and are numbered consecutively, as shown at the right.

Each section has a black tab which lines up with the corresponding section at the right. The black tabs are quickly located by bending this book back.

The contents of each section can be determined at a glance by referring to the index on the other side of this page.

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## SPARE PARTS CATALOG

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## PREPARATION OF REQUISITIONS

## SAMPLE COPY FOR USE IN THE PREPARATION OF REQUISITIONS

Revisions in QMC Form 400 for requisitioning spare parts are confined to new column headings. Until new forms are available all organizations are to continue using the present form and either type or write in corrections indicated in column

form and either type or write in correction indicates in wheadings.

Under revised heading "Nomenclature and Unit" list the article and the unit (ea for each, 1b for pound, etc.). Under heading "Authorized or Maximum Level" list the authorized depot stock levels or organizational allowances given in Part Ill of the Corps of Engineers Supply Cataloq. The total number on hand for each item is listed under "On Hand." In column

headed "Due In" enter the total quantity previously requisitioned but not delivered. For "Initial" and "Replenishment" requisitions, the sum of "Required," "Due In," and "On Hand" should equal the "Authorized or Maximum Level."

On this page is shown a sample requisition on QMC For No. 400 which conforms to the latest revisions. The marginal notes give instructions for preparing a requisition for spire parts for Engineer equipment. Additional information on this subject is contained in section AA-1 of Part III Engineer Supply Catalog, available from the Engineer Field Maintenance Office, P. O. Box 1679, Columbus, Ohio.

State PERIOD designation by use of one of the following terms:

(1) "INITIAL"—first requisition of authorized allowances.

(2) "REPLENISHMENT"—subsequent requisitions to maintain Type "SPARE PARTS" in upper right hand corner of requisition. (3) "SPECIAL"—requisition -requisitions for necessary repairs not covered by allowances. Q. M. C. FORM No. 600 SPARE PARTS ( BAMPLE ) REQUISITION To: Engineer Supply Officer. No. of Sheets
Columbus Army Service Forces Depot, COLUMBUS, OHIO.
Requisities No. E-531-3-44 Date July 5, 1943 Give complete shipping it tions. Special instructions to the instruction at the end of the be given at the end of the Engineer Property Officer, Pine Camp, Hew York, MARKED FOR: Supply Officer, 502nd Engineer Estation, Pine Camp, N. Y. REQUISITIONED BY (show Signature, Rank, Organization, Destination. If dif-ferent from "sum ro" include address): For the Commanding State proper nomendature of ma-chiner, and make, model, serial chiner and registration number. Robert E. Roe. Major, C. E., Engineer Property Officer Col., C. E., Executive Officer. Prepare & separate requisition for each different machine AUTHOR-IZED ON HAND NOMENCIATURE AND UNIT MFG. No. PARTS FOR TRACTOR, CRAWLER TYPE DIESE Size basis or euthority and date delivery is required, immediately below description of mechines INTERNATIONAL HARVESTER MODEL TD-18 Basis: Repair of Disabled Equipment. Delivery is requested by July 30, 1943 Double space between items ENGINE GROUP 1 Crankshaft with nut 0 0 ROORS DAX 0 Oil seal gasket 32309 D Group parts required under group headings as shown in manulec-turers Manuals. FINAL DRIVE GROUP Sprocket drive pinion (13 teeth) 64497 D n STEERING MECHANISM GROUP 8679 DA Release lever State manufacturers pare numbered authorities of completely. Do not completely. Do not use aborevisions. Steering clutch operating O n rod yoke COMMON SUPPLIES Hex. jam nut, 1/2" N.F.

\* Nonexpendable items such as tools must be accounted for, when requisitioned, by a statement that they have been placed on REPORT OF SURVEY or STATEMENT OF CHARGES.

## PREPARATION OF REQUISITIONS

## Sample Copy for Use in the Preparation of Requisitions

A sample requisition in the correct form for submission by the Engineer Property Officer is shown on the opposite page.

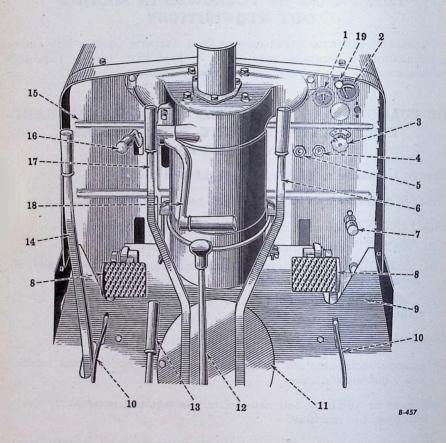
# THIS SHALL BE FOLLOWED IN MAKING OUT REQUISITIONS

In order to eliminate duplication of work, Property Officers may authorize organizations to prepare requisitions in final form, leaving requisition in umber space blank for completion by Property Officer.

## "THE FOLLOWING RULES WILL BE OBSERVED CARE-FULLY IN PREPARING REQUISITIONS FOR SPARE PARTS:

- ca. Prepare a separate requisition for each different machine.
- Ib. Type "SPARE PARTS" in upper right hand corner of requisition form.
- oc. State PERIOD designation by use of one of the following terms:
  - (1) "INITIAL"—first requisition of authorized allowances.
  - (2) "REPLENISH"—subsequent requisitions to maintain authorized allowances.
  - (3) "SPECIAL"—requisitions for necessary repairs not covered by allowances.
- od. Give complete shipping instructions.
- ee. State proper nomenclature of machine, and make, model, serial number and registration number.
- ff. State basis or authority and date delivery is required, immediately below description of machine.
- og, Group parts required under group headings as shown in manufacturers' parts catalog.
- Ih. State manufacturers' parts numbers and nomenclature descriptions accurately and completely. Do not use abbreviations.
- iii. Double space between items.
- jj. Emergency requisitions sent by telephone, telegraph, or radio, must always be confirmed immediately with requisition marked: **\'Confirming** (state identifying data)."
- Mk. Nonexpendable items must be accounted for.

## CONTROLS AND DASH



		CONTROLS AND DASH - Continued		
Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.
1 2	42383 D 41934 DB	Ammeter (A-C Spark Plug Co. No. AM-1801) . Oil pressure indicator with clamp (see	1	.250
3 4	58202 D	list below)	1	.500
5	58204 D	8, pages 4 and 5 also)	1 1 1	.250 .000 .312
6	::::::::	Cotter, 1/16 x 3/8" Steering clutch lever, right hand (see Section 12, page 5)	1	.000
7 8 9	42553 DXA	Starting switch (see Section 3, page 10). Brake pedal pad (see Section 12, page 7).	 1	25.000
10	Q 1802 Q 1920	Engine clutch cover.  Cap screw, 3/8 x 1" N.C.  Lock washer, 3/8".  Brake pedal lock (see Section 12, page 7).	10 10	.052
11	42547 D Q 4016 Q 1920	Engine clutch inspection cover Cap screw, 3/8 x 5/8" N.F Lock washer, 3/8"	1 3 3	4.312 .048 .005
12		Gear shift lever (see Section 14, page 1). Hi-Low shifter lever (see Section 14, page 1) Cap screw, 1/2 x 1-5/8" N.C	···· i	.134
14	Q 1922 Q 1877	Lock washer, 1/2"	1	.013
15	Q 1911 Q 1925 58199 DA	Cap screw, 5/8 x 2-1/2" N.F	1	.127 .013 53.000
:::	Q 1856 Q 1922	Dash and Cowl assembly	2 2	
16 17		Compression release lever (see Section 11, page 4) Steering clutch lever, left hand (see		
18		Steering clutch lever, left hand (see Section 12, page 5) Governor control lever (see Section 11, page 4)		
19	51502 D	page 4)	2	.093
	OIL PR	ESSURE INDICATOR AND CONNECTI	ONS	
:::	16445 D 29898 D	Oil pressure indicator tube clip felt Oil pressure indicator coupling nut (in oil indicator)	1	.001
:::	29898 D 42493 DX	Oil pressure indicator coupling elbow nut. Oil pressure indicator tube coupling elbow (in engine crankcase)	1	.015
	59990 DX	Oil pressure indicator tube with nuts (indicator to engine) Oil pressure indicator tube clip	1 1	
:::	59991 D	Round head slotted screw, No. 10 - 24 x 1/2" Hex. nut. No. 10 - 24	1 1 1	
:::	60805 D 53031 D	Lock washer, No. 10	1	.125
:::	42493 D	Hex. nut, No. 12 - 24" N.C Oil pressure gage coupling elbow (in en-	2 2	
		gine crankcase)	11	1

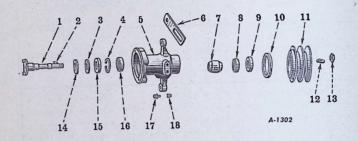
#### FAN AND WATER PUMP

25 25 25 25 25 25 25 25 25 25 25 25 25 2	Weight Lbs.	29.500	1.000 2.007 2.000 1.906 14.000 2.845 2.831 2
33 40 41	No. Used	-	нананананачана напананачана
29 30 31 33 34 35 36 37	Description	Water pump (includes Ref. Nos. 1 thru 37 and 39 thru 42) .	Pump body cover.  Pump body cover gasket  Pump impeller.  Shaft and sleeve assembly.  Pump body gasket  Cap screw, 1/2 x 2-1/2" N.C.  Cap screw, 1/2 x 3-1/4" N.C.  Cap screw, 1/2 x 3-1/4" N.C.  Cap screw, 1/2 x 2-1/2" N.C.  Cap screw, 1/2 x 2-1/2" N.C.  Cap screw, 1/2 x 3-1/4" N.C.  Cap screw, 1/2 x 3-1/2" N.C.  Lock washer, 1/2"  Pipe plug, 3/8"  Lubricator (Lincoln No. 5000).
8	I H C Part No.	42686 D	32350 D 32351 D 5008 DCX 32353 D 59824 D 5950 DX 0 1862 0 4044 0 1862 0 1862 0 1862
P422	Ref.	::	1 м м ч м м м м м м м м м м м м м м м м

# FAN AND WATER PUMP - Continued

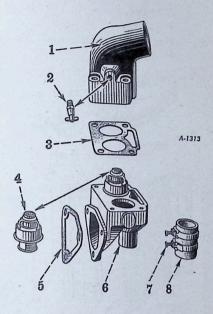
	.625	4.468	.125	.687	203	200.	390.	1.750	.128	. 265 791	1.875	.062					800.	203	2.062	.087		312	050	.015	2002	9.750	300.	
нню	י מי ר		7	<b>Q</b> 2 Q	2 1	-	1	7	-1,	-1-	1	1	As req'd	. 9	9	တ လ	מ ר		11	CZ	03 (	.,,	1-	11	۲,	-10	202	
Lubricator with cap (Lincoln No. 5575)	ball bearing (IHC) (optional)	bearing spacer	bearing retainer ring	Pump ball bearing (New Departure No. 3207) (optional).	eal	Bearing retainer gasket	Bearing retainer with oil seal	Bearing lock sleeve		Pump packing grand	shaft	shaft		Pump body cover stud	Hex. nut, 5/16" N.F.	Lock Washer, 5/16"	Fump boay spacer	fully real master	Fan belt (pair)	Pump driving stud	Lock washer, 3/8"	Pump drive spring.	Fump driver.	Hex. nut. 5/16" N.F.	Lock washer, 5/16"	Fan assembly	Cap screw, 3/8 x 1" N.C.	, 0
QA 2628 Q 2659 (20308 D	ST 205A	32356 D	27654 D	ST 2054	20289 D		2009 DX	20293 D	04515 H	20203 D	32354 D	24017 D	50790 D	32352 D		00 TAO	02649 D	00000	42937 DX	34321 HA		G 3792	U 00000	0 1903		32357 D	¢ 1802	
116	8 0	202	21	22	23	24	25	526	200	0 62	30	31	22	34	:		26	37	38	62		40	147	740		43	.,	

#### FAN BELT IDLER



Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.
	63007 D	Fan belt idler, includes Ref. Nos. I through 5 and 7 through 18	1	10.875
1 2 3 4 5  6  7 8 9 10 11 12 13 14 15 16	5988 D 1266 C 42940 D W 16210 5989 D 42942 D 42940 D	Cap screw, 1/2 x 4-1/2" N.F.  Hex. nut, 1/2" N.F.  Lock washer, 1/2".  Idler pulley brace  Cap screw, 3/8"x 1" N.C.  Cap screw, 3/8 x 1-1/4" N.F.  Hex. nut, 3/8" N.F.  Lock washer, 3/8".  Washer, 13/32" I.D. x 3/4" O.D. x 16 ga.  Idler gearing spacer  Idler bearing (New Departure No. 3203)  Idler oil seal  Idler pulley felt.  Idler pulley felt.  Idler shaft felt retainer.  Idler shaft felt retainer.  Idler bearing (New Departure No. 3204)  (optional)  Idler bearing (IHC) (optional)	111111121111111111111111111111111111111	.843 .006 .005 .062 5.250 .301 .069 .013 .312 .052 .060 .031 .005 .125 .125 .012 3.750 .013 .013 .013 .012 .025 .013 .013 .013 .025 .025 .025 .025 .025 .025 .025 .025

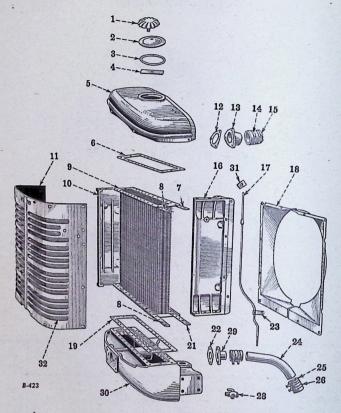
#### THERMOSTAT



Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.
1  2 3 4 5 6	5952 D Q 1860  9982 T 42655 D (37634 D 33814 D 42654 D 5951 D Q 1852	Thermostat housing	1 4 4 1 1 2 2 1 1 3 3	8.000 .189 .013 .062 .012 .312 .012 6.250 .134
7 8	91406 HA 42656 D	Lock washer, 1/2"		.013 .068 .125

When ordering, always use I H C Part Nos.

#### RADIATOR



Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.
	42615 DE	Radiator (includes Ref. Nos. 5 thru 10, 16, 17, 19, 21, 23, 24 and 30)	1.	518.000
. 1 2 3 4  5 6 7  8	42610 D 5913 D 10429 D 42158 D 5940 DA 68072 D 42599 D Q 1802	Handle Cover Gasket complete Clamp. Brass cotter, 5/32 x 3/4" Water tank, upper. Gasket Core stiffener, upper, rear. Cap screw, 3/8 x 1" N.C. Lock washer, 3/8". Core stiffener, front.	1 10 10 2	.720 2.250 .750 .812 102.000 .050 1.750 .052 .005 2.000
	Q 1802	Cap screw, 3/8 x 1-1/8" N.C	12 12 24	.060

(Continued on next page)

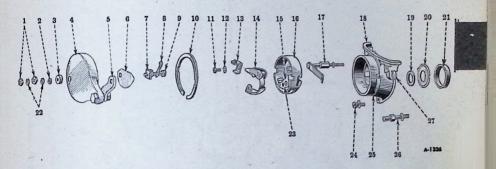
#### RADIATOR - Continued

Ref.	I H C Part No.	Description	No. Used	
9	42538 DA 42589 D 5945 DA	Core	l req'd	87.000 .039 25.500
:::	Q 1854 Q 1852	Core spacer, R.H.  Cap screw, 1/2 x 1-3/4" N.C.  Cap screw, 1/2 x 1-1/2" N.C.  Lock washer, 1/2"  Cap screw, 3/8 x 5/8" N.C.  Lock washer, 3/8"	2 6 8	.148 .134 .013
ii	42603 DA Q 4016	Grille	16	25.000 .041 .005
12	42536 D	Lock washer, 3/8"	16	.005
13		Washer, 13/32" I.D. x 7/8" O.D. x 16 ga. Elbow gasket Inlet elbow Cap screw, 3/8 x 1-1/4" N.C. Lock washer, 3/8". Inlet hose clamp Inlet hose (2-7/8" I.D. x 2-7/8" long) Core spacer, L.H. Cap screw, 1/2 x 1-3/4" N.C. Cap screw, 1/2 x 1-1/2" N.C. Lock washer, 1/2". Overflow pipe. Sheet, L.H.	3 3 9	.060
14 15 16	91406 HA 42612 D 5944 DA	Inlet hose (2-7/8" I.D. x 2-7/8" long) Core spacer, L.H.	1 1 2	.250
:::	Q 1854 Q 1852	Cap screw, 1/2 x 1-3/4" N.C	6 8	.134
17	42601 DAX 42544 DA 42545 DA	Sheet R.H	1	4.000
19	Q 4016 68072 D	Cap screw, 3/8 x 5/8" N.C. Lock washer, 3/8"	111	.005
21		Core stiffener, lower, rear. Cap screw, 3/8 x 1-1/8 n.c.	10	.060
22 23	32181 D 42914 D	Outlet elbow gasket.		.005 .083 .045
24 25		Outlet pipe		2.000
26 28	91406 HA 42605 D 6442 D	Outlet hose clamp.		.062 1 .361 1 1.250
29	Q 1806	Outlet flange	•	2 .134 2 .013
30 31 32	5941 DB 52033 D 49106 D	Overflow pipe gasket		1 .001

When ordering, always use I H C Part Nos.

#### MEMORANDA

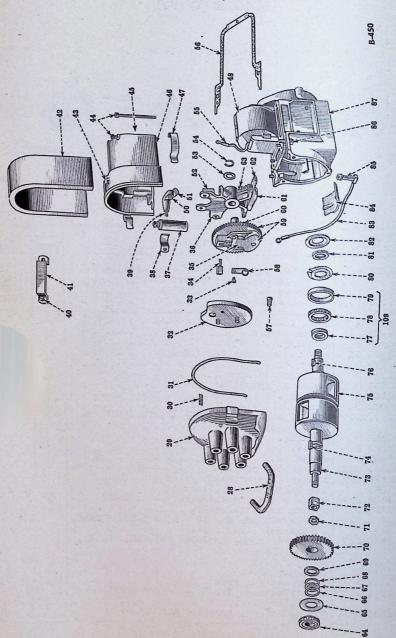
#### MAGNETO (F-6)



Ref.	I H C Part No.	Description	No. Used	Wt.
	32361 D	Magneto, complete (F-6) (includes parts listed on pages 1 thru 5)	4	13.000 .076 .005
1 2 3 4 5 6 7 8 9	E4-267A E4-271 30037 D 3930 DX 32673 D 31135 D 30036 D 30035 D 30038 D	Nut. Plain washer Bushing. Cover, includes Ref. 10. Link Spring insulator Terminal insulator Spring Screw.	1 1 1 1 1 1 1 1	.006 .001 .002 .218 .031 .001 .002 .001
10 11 12 13 14 15 16 17	21327 D 21393 D 21394 D 21388 DBX1 21373 DBY1 21383 D 21368 DBY6 21329 DX	Breaker arm assembly		
19 20 21 22 23	E4-226 21330 D E4A-352 21384 DXA	Felt Retainer Outer bearing race Lock washer, No. 10 - 1/16 x 3/64" (cad plated) Spring anchor, includes Ref. 15.		.003 .006 .037

(Continued on pages 3 and 4)

# MAGNETO (F-6) - Continued



Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

# MAGNETO (F-6) - Continued

Wt. Lbs.	.015		.093	187	.077		:	.TO.		000	.006	3.750	125	
No. Used	Н	1	нн	-	11	1	н	-1	н	нн	02 -	144	व्य व्य व्य	
Description	Brush and Fillist	r, No.		Distributor bearing, includes Ref. 52, 61, 62	Condenser	ad. pl	- 1/16 x 3/64" (cad. plated)	Lock washer, No. 8	ad)	Spring	Screw	with felt	Screw, long	
I H C Part No.	21463 DAXA		21460 DY	2551 DAY6	21409 DB		r 001 to	עדייייי די		21366 D	21324 D 21323 D	21322 D	21318 D E4-295	
Ref.	34		35	36	37		0	8:		39	40	42	44 45	
Wt. Lbs.	600.	900	.001	107		900	.003	:	.156	.750	.500	1000.	.002	
No. Used	1	чч	1	α <sub>H</sub>		нн	г.	н	нн	н.	٦.	r-d-	4 1	
Description	Screw No.10,	1/64 x 5/4" (cad. plated)	Breaker stop gasket (not seen) Slotted round head	screw, No. 5 - 40 x $3/16^{\mu}$ .	Lock washer, No.10,	plated)	Oiler felt (not seen) Short circuiting	holder	Seal, lower Block, includes Ref.		Distributor contact	Seal, upper Disc and inserts.	Screw, No. 5 - 40 x 5/16".	
I H C Part No.	21441 D	A ( ) A ( ) A ( )	S1444 D	28856 D		E4-295	E4-216 E4A-311	25796 DA	21347 DC 28656 DZA	28656 DYA	28674 D	21348 DB 28657 DX		
Ref.	24 :		\$22	56	•	20	:		28	29	30	51	222	-

(Continued on next page)

# MAGNETO (F-6) - Continued

:	25	60	000	200	35	74	00	33	3.50	2.5	60	33	60		S	0.0	0				Q	,			0		• 02	1
Wt. Lbs.	.002	600.	200	.012	ŏ.	ŏ.	2.500		.025			00.	600.		.025	.009	3			:	.012				2.750		.002	
No. Used	-1-	1-1	٦-		٦	7	1	1	Ч	-	11	1	1		1	-1-	-			Н	CQ.		a	2	П		αн	
Description	Shim, medium.		Pinion (40 teeth)	Cam	key	Key (Woodruff No. 3).	64 to 78.inclusive	Key (Woodruff No. 3).	Inner bearing race.			Felt	Felt retainer	Primary lead-out and	terminals	Shield.	Special heavy lock	m	3/32 x 3/64" (cad.	plated)	Screw	LOCK Washer, No. 10	(cad. plated).	Frame, includes Ref.	56, 79, 80, 81, 82	Flat head slotted screw, No. 8 - 32	x 11/16"	- 1
I H C Part No.	E4-212	21340 D	33138 D	21468 D	21342 D	4167 T	בדחחח העם	4167 T	E4A-351	E44-352	30379 D	E4-226	30378 D	21399 DX		21331 D	מוכסדי			4 4 4	E44-058			2546 DBYb Frame,			24616 DA	
Ref.	67	69	22	72	73	74	2	92	77	202	80	81	85	83		α 4 π	3:			0	00			87			88	
Wt. Lbs.	127	.093	807		.795	. 250	.031			:		::::	.003	.003	1000	900	900	900.		.312	303.	.012	.012			.029	.031	
No. Used	-	100	-	4	-1	Н 0	2 -1		c	2		જ	Н,	٦,		-1-	110	7		٦,	1		Q		c	v H	НН	
Description	Cover, includes Ref.	Spring	Coil with insulators	Coil and core with	insulation	Coil with screws	Secondary lead-out.	Fillister head	Slotted screw,			(cad. plated)	Felt	Washer	Took out tube	Gasket.	Screw	Contact spring	Shaft, gear and dis-	tributor	Shim	Shim.	Screw	Lock washer, No. 10	- 1/16 x 3/64"	Retainer with balls .	Oil flinger Shim, light	
I H C Part No.	2547 DX		ZT401 DAX	156539 DX		38609 AA							38041 D	U 19512	ע אסטבא	U 61212			21469 D	פון הפגופ	91353 D	21466 D	E4A-358			E4A-353	E4A-324 E4A-305	-
Ref.	46	47		48		50	51	•					225	000	ם ה	56	57	58	29	09	36	62	63	:		64	65	1

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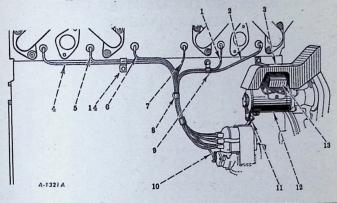
#### MAGNETO (F-6) - Continued

			Wt. Lbs.		<b>.</b> 004	.218		:	900		.890	180.
			No. Used	Н	4	1		4	41		нн	CZ
A-1335	100	103 104 105	Description	118	Screw, No. 8 - 32 x 5/8"	coupling cover with oiler.	screw, No. 8 - 52 x 5/8" (cad.	-	(cad. plated)	Impulse coupling ro- tating member, includes Ref. 95	Pin to loo inclusive . Boton shaft housing	Includes Ref. 77, 78, 79
	©	101 102	I H C Part No.			SUSE DA			27311 D	36246	24609 D E4-294	
93		100	Ref.	:	104	TOP	:		106	107	108	
		99	Wt. Lbs.	.006	.012	967.	0001	.002	. 343	.468	250	013
6/1			No. Used	НН	НН	4	10 03	03 03	1 1	н	ННГ	144
88 89 89 89 89 89 89 89 89 89 89 89 89 8		93 94 95 96 97 98	Description	Spring.	Pawl. Latch	Flat head slotted	Span wing	Washer.	Magneto member with	Magneto member, in- cludes Ref. 95,	Spring	Washer. 1/2"
			I H C Part No.		22671 D	7 05122	J 7114 D	24610 D		32712 D	24605 DA 24602 DA	24603 D 24604 D
			Ref.	88	92	93	0 4	96	n	98	1000	101

#### MAGNETO BRACKET AND DRIVE

2	Wt. Lbs.	1.500	17.500	-			.013		.031	.047	.035	.781		:	125	
E. S	No. Used	-	<b>⊣</b> ∞	4	7	-	4.	4 0	c c	02 -	11	н	1	-1-	4-	1
14 15 16	Description	Gear (36 teeth) Bracket with dowels, bushings and pipe	plugs	Cap screw, 1/2 x 2" N.F.	Cap screw, 1/2 x 2-1/4" N.F.	Cap screw, 1/2 x	washer, 1/	Gasket	Dowel	Bushing	Pin	.t.	1/2" N.F.	Hex. nut, 1/2" N.F.	3 . 2	
5.	I H C Part No.	32500 DA 5947 DX		0 1855	0 1857		9 1922	0 1909 25352 D	32504 D	32506 D				6061 6	32502 D	
27.	Ref.	18		:	:	:	•	.00	000	22	242	25	:	:	26.	2
900	Wt.	.187		.093	012	900.			.156	.187	. 250	.031	100.	1.937	1.300	-004
110 11	No. Used	н		14-	4.	4-4-	-	Q 0	2 ⊢	-10	2 1	4	-	٦	4	11
3 4 2 3 3 4 5 6 5 6 5 6 5 6 5 6 5 6 5 6 5 6 5 6 5	Description	Slotted fillister		H	بالله	Shim (light)	Cap screw, 1/4 x	7/16" N.F.	Oil seal.	Spacer	Bushing	Washer.	Gasket	(27 teeth)	ith do	Fipe plug, 1/8" Key
	I H C	28388 DA		35719 D	10481 D		22716 D	0101	33788 D		35319 D		32505 D		32499 DAX	13085 D
	Ref.	r :	c	010	4 10 (	02-1	ю :		· 0	25	121	12	14	1	16	17.

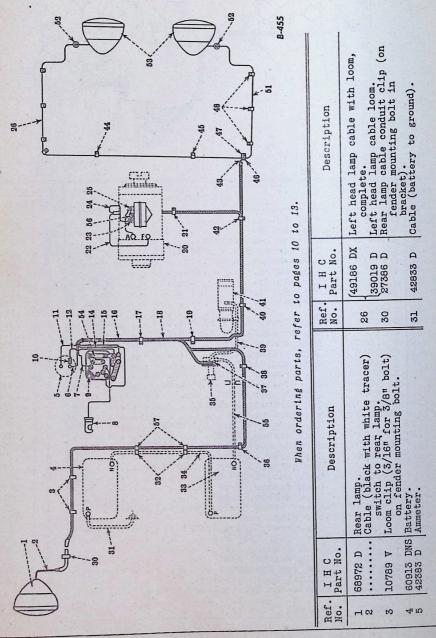
# SPARK PLUG CABLES, ETC.



Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.
No.  1 2 3 4 5 6 7 8 9 10 11 12 13 14	Part No.  65347 D 65346 D 43006 D Q 1920 65340 D 65351 D 65355 D 65335 D 39749 DA Q 4016 Q 4000 Q 1920 Q 1918 Q 1902 27387 D Q 1800 Q 1920 46886 DX 5992 D Q 1836 Q 1921 50585 D Q 1836 Q 1920 Q 1919 57550 D 56458 D Q 1919 57550 D 56458 D Q 1919 2 1920 Q 1919 57550 D 56458 D Q 1920 Q 1918 27618 D	Cable, No. 2. Cable, No. 1. Generator heat shield Cap screw, 3/8 x 3/4" N.C. Lock washer, 3/8" Cable, No. 6. Cable, No. 5. Cable, No. 4. Cable, No. 3. Clip. Cap screw, 3/8 x 5/8" N.C. Cap screw, 1/4 x 5/8" N.C. Lock washer, 3/8" Lock washer, 1/4" Hex. nut, 1/4" N.C. Clip, front Cap screw, 3/8 x 3/4" N.C. Lock washer, 3/8" Short circuiting cable. Generator bracket Cap screw, 7/16 x 1-1/4" N.C. Lock washer, 7/16" Generator (Delco-Remy No. 1101724) Cap screw, 3/8 x 1-3/4" N.C. Cap screw, 5/16 x 1-3/8" N.F. Hex. nut, 5/16" N.F. Lock washer, 5/16" Cut-out relay (Delco-Remy No. 1116810) Cable clip, rear Cap screw, 1/4 x 1/2" N.F. Hex. nut, 1/4" N.F. Lock washer, 3/8" Lock washer, 3/8" Lock washer, 3/8" Lock washer, 3/8" Lock washer, 1/4" Cable reinforcement	Used 1 1 2 2 1 1 1 1 1 1 1 1 1 1 2 2 1 4 1 1 1 1	Lbs.  .078 .109 2.375 .045 .005 .156 .125 .093 .125 .041 .017 .005 .002 .007 .015 .045 .005 .062 .625 .084 .01 .18.750 .076 .046 .015 .005 .015 .005 .015 .005 .015 .005 .00
:::		Terminal (push type).  Cable assembly (includes Ref. Nos. 1, 2, 4 5, 6, 7 and 10).  Terminal (ring type).		
	1924 T	Terminal (ring type)	e hou	

NOTE: All service and replacement parts for the generator should be referred to an authorized United Motors Service Branch or Service Station.

#### STARTING AND LIGHTING UNIT WIRING DIAGRAM



# STARTING AND LIGHTING UNIT - Continued

Cable clip (on seat support, front) battery to hattery	Battery. Cable (battery to battery).	Man.	on seat support, front Cable (natural with red tracer)	starting switch to ammeter (order 59184 D).	Loom clip, long (1/4" for 3/8"	mounting screw.	Cable (starting switch to starting motor).	Loom clip (1/4" for 3/8" bolt) on	Starting motor. Loom clip (1/4" for 3/8" bolt) on	side angle. Cable (black) switch to head lamp	(order 59184 D). Loom clip (1/4" for 3/8" bolt on	fan shroud bolts. Loom clip (1/4" for 3/8" bolt) on	fan shroud bolts. Head lamp junction block with	bracket, complete.	Head lamp junction block. Head lamp junction block bracket.	Loom clip (1/4" for 3/8" bolt) on	Right hand head lamp cable	-	Head lamp cable grommet.	Fuse	Mounting screw.	Rear lamp cable clip (on seat support, front).	
28100 D	60913 D 41906 D	64931 H 10439 VA			27248 H		41909 D	27385 D	42999 D 27385 D		27385 D	27385 D	(42917 D	4 2007	42915 D	27385 D	30422 D	A 00000	1627 V 68972 D	10815 V	את פחפדב	42914 D	
32	552	36	37		38		39	40	41	43	44	45		46	47	48	72	1	52	55 4 R	200	57	
Cable (natural with black and red cross tracers) generator to	Cable (black) switch to junction	order DSIG4 D).	Cable Insulator (ammeter to	Switch). Cable (natural with red tracer)	starting switch to ammeter (order 59184 D).	Cable, less loom (ammeter to	switch). Cable (black with white tracer)	switch to rear lamp (order 59184 D).	Cable (natural with black tracer) generator field to switch	order 59184 D). e harness. Must be clipped	so it lays close against dash and at least 2-1/2" away from	exhaust manifold.  Loom clip (3/8" for 3/8" bolt)	is. Must be clipped	so that it does not cross	Pedal must not touch	at any time. (1/4" for 5/8" bolt) on	flywheel housing bolt.	m clip (1/4" for 1/2" bolt) on	magneto bracket bolt.	generator field to switch	als D).	Cable (natural with black and red	ler
Cable (natu	Cable (black	Dash lamp.	Cable insulat	Cable (natu	starting switch (order 59184 D)	Cable, less	Switch).	switch to 59184 D).	Cable (natur	Cable harness.	so it la	Loom clip (8	Cable harness.	so that i	pedal. P	Loom clip (	flywheel.	LOOM CLID (	Cable (natur	generator	"BAT" terminal.	Cable (natural wi	ammeter (order
Cable (nati	Cable (black	65534 D Dash lamp.	ф ш	Cable (natu	starting (order 59	30436 D Cable, less	Cable (black	switch to 59184 D)	Cable (natur	59184 D Cable harnes	so it la	S8411 D Loom clip (	59184 D   Cable harnes	so that 1	pedal. P	61271 D Loom clip (	200	D Loo	magneto l	generator	"Order of "BAT" termin	Cable (natu	ammeter (ord

#### STARTING AND LIGHTING UNIT

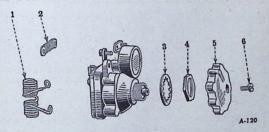
	STARTING AND DIGITING CIVIL		
I H C Part No.	Description	No. Used	Wt. Lbs.
60938 D 62302 D	Loom clip (1/4" for 3/8" bolt)	14	.015
0 20030	bolt)	1	.031
62302 D	Loom clip (1/4" for 1/2" bolt)	1	.031
38100 D	Pottonir to bettory cable Clib.	6	.031
Q 1800	Cap screw, 3/8 x 3/4" N.F	2	.045
Q 1905			.005
Q 1920 38411 D	Lock Washer, 5/0".	l ĩ.	
41916 D	Loom clip (3/8" for 3/8" bolt)	1	.062
42383 D	Ammeter	_	.250
42914 D	Rear lamp cable clip	2	.083
42915 D	Head lamp junction block	1	.010
	Round head machine screw, No. 10 - 24 x 1/2"	1	
	Hex. nut, No. 10 - 24.	i	
42916 D	Head lamp junction block bracket	1	.031
42917 D	Head lamp junction block and bracket assembly.	1	.062
42921 D	Head lamp bracket	2	.750
Q 1848	Round head machine screw, No. 10 - 24 x 1/2"  Hex. nut, No. 10 - 24.  Lock washer, No. 10.  Head lamp junction block bracket  Head lamp junction block and bracket assembly.  Head lamp bracket.  Cap screw, 1/2 x 1" N.C.  Lock washer. 1/2".	4	.106
Q 1922	Lock washer, 1/2"	1	.013
42921 D	Rear lamp bracket	2	.106
Q 1847 Q 1909	How mut 1/21 N.F.	2	.069
Q 1909 Q 1922	Lock washer, 1/2"	2	.013
*42999 D	Rear lamp bracket.  Cap screw, 1/2 x 1" N.F.  Hex. nut, 1/2" N.F.  Lock washer, 1/2".  Starting motor (Delco-Remy Model No. 756).	1.	45.000
Q 1849	Can screw. 1/2 x 1-1/4" N.F	1 0	1 . 120
Q 1922	Lock washer, 1/2".	3	.013
68972 D	Lock washer, 1/2".  Head lamp or rear lamp (see detail list, page 12)	3	7.000
*50585 D	10		25.000
Q 1808	Cap screw, $5/16$ x $1-3/4$ "		.076
	. Cap screw, 5/16 x 1-3/8" N.F	1 1 4	.046
Q 1903	Hex. nut, 5/16" N.F	1	.015
Q 1920	Lock washer, 3/8".  Lock washer, 5/16"  Battery - Willard No. 5245 Type DRG-17-3	1	.003
Q 1919 (55468 D	Bottomy Willard No. 5245 Type DRG-17-3	100	
** 1 22 400 D	Battery - Willard No. 5245 Type DRG-17-5 (optional).	2	
60913 DN	S Battery - Auto-Lite H-17 (optional)	2	70.000
₹57550 D	(optional)  Battery - Auto-Lite H-17 (optional). Cut-out relay (Delco-Remy No. 1116810) Lighting switch (see detail list, page 11) Battery cable shield Cap screw, 3/8 x 5/8" N.F. Lock washer, 3/8" N.F. Lock washer, 3/8" Loom clin (1/4" for 5/8" bolt)	1 1	.750
57311 DX	Lighting switch (see detail list, page 11)	li	
59989 D	Battery cable shield	3	.045
0 1905	Hay put 3/8" N.F.	3	
Q 1905 Q 1920	Lock washer. 3/8"	3	.005
61271 D	Loom clip (1/4" for 5/8" bolt)	1	
63323 D	Potteny coble grownet (in dash).	1	.012
65534 D	Dash lamp	1 1	.125
27248 Н	Loom clip (1/4" for 3/8" polt)	1	.437
64931 H	Can screw 1/4 v 1-1/2" N.F.	2	.029
Q 1761 Q 1901	Hex. nut. 1/4" N.F.		.007
o 1918	Hex. nut, 1/4" N.F Lock washer, 1/4"	. 2	.002
-			

<sup>\*</sup> All service and replacement parts should be referred to an authorized United Notors Service Station or Branch. \*\* All service and replacement parts should be referred to the battery manufacturer.

#### STARTING AND LIGHTING UNIT - Continued

I H C Part No.	Description	No. Used	Wt. Lbs.
10439 VA 10815 V 1627 Y	Loom clip (3/16" for 3/8" bolt)	1 1 2	.062
	CABLES		
30436 D 30693 DX	Ammeter to switch cable, includes 2 terminals 38433 D	1	1.000
41906 D	38433 D, loom 30422 D, and 2 clamp rings 27618 D	1	.152
41906 D	minal 26375 H, with bolt and nut 26453 HX and negative terminal 26376 H, with bolt and nut		
41908 DA	minal 46074 H and negative terminal 26376 H		2.125
41909 D	with bolt and nut 26453 HX Starting switch to starting motor cable, in-		2.750
42833 D	cludes terminal 46074 H and terminal 23431 D. Battery to ground cable, includes positive ter-	1	.750
49186 DX	minal 38778 D, with bolt and nut 26453 HX	1	1.000
59184 D	27618 D	1	.250
22104 D	minal 27637 H and 8 terminals 38433 D	1	1.375

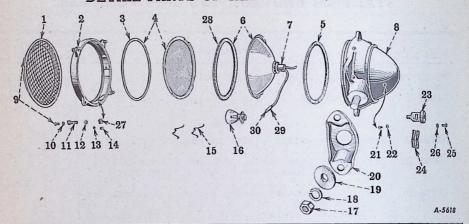
#### DETAIL PARTS OF LIGHT SWITCH (57311 DX)



Ref.	I H C Part No.	Delco-Remy Part No.	Description	No. Used	Wt. Lbs.
***	57311 DX		Light switch	1	.625
1 2 3 4 5 6	43039 D 43040 D 49425 H 57312 D 57313 D 64022 H	1877830 1877831 1882012 1882013 1864099	Dimmer resistance coil	1	.015 .008 .015 .015 .083 .002

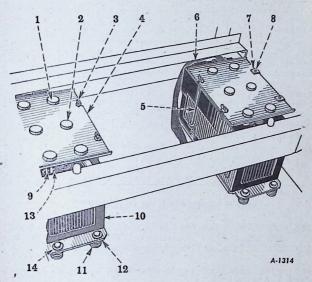
Don't order parts from the illustrations only; refer to the list also.

#### DETAIL PARTS OF HEAD LAMP (68972 D)



Ref.	I H C Part No.	Guide Lamp Co. No.	Description	used lamp	
7	69369 D 68417 D	5935617 5935509	Door and guard assembly with lens Terminal plate assembly		
	68417 D 69373 D 69370 D 69372 D 50784 D 68418 D 65401 D 51893 D 69368 D 69374 D 41229 H 69376 D Q 1915	5935509  5935616 5935615 5935246 921634 5935245 5931286 924023 5935618 5935504		11111111114 444112111111111111111111111	.750 .062 .000 .031 .127 .013 .012 .750
	79398 H 68084 D 27640 H 69805 D 47834 H 104562 H	921789 804463 1867662 5933831 120622 121752	Reflector gasket Insulating sleeve Terminal wire Ground screw Ground screw nut Ground screw lock washer	1 1 1 1 1 1 1	

#### BATTERIES AND CONNECTIONS



Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

HRef.	I H C Part No.	Description	No. Used	Wt. Lbs.
1	50234 D	Battery hold-down rubber, short	4	.046
2	50235 D	Battery hold-down rubber, long	8	.062
3	Q 3505	Wing nut, 5/16" N.C	4	.014
4	41832 DBX	Cover	2	4.500
5	52435 D	Bolt	4	.250
6	42833 D	Ground cable	1	1.000
7	41831 D	Washer	4	.031
8	41830 D	Stud	4	.312
	Q 1904	Hex. nut, 5/16" N.C	16	.015
9	41908 DA	Starting switch cable	1	2.750
	60913 DNS	Battery (Auto-Lite No. H-17) (optional)	2	87.000
10	35468 D	Battery (Willard No. 5245 Type DRG-17-3)		
	1	(optional)		88.000
11	∫37976 D	Battery bottom rest spring	8	.125
	141827 D	Battery bottom mounting spacer	8	.125
12	41826 DXA	Battery bottom support	2	6.250
	Q 1858	Cap screw, 1/2 x 2-1/4" N.C	8	.175
		Washer, 17/32" I.D. x 1-1/4" O.D. x		
		14 ga	8	
13	26453 HX		4	.050
14		Washer, 17/32" I.D. x 1-1/4" O.D. x 14 ga.	8	

#### ENGINE

Air Cleaner and	Conne	ctio	ns																1
Camshaft																			6, 8
Crankcase																			2 to 4
Crankcase Guard.																			5
Crankcase Oil Pa	n	200																	14, 15
Crankshaft						1													10 to 13
Cylinder Head.				5	0														6 to 8
Cylinder Sleeves					3														10. 11
Exhaust Muffler				3.4								Sec. A			35				18
Exhaust Muttler					•		•	•	•	20				13	-				
Flywheel													•						10, 11
Front Pull Hook																			5
Fuel Oil Filter																			9
Lubricating Oil	Filte	er .	-																9
Lubricating Oil	Pump																		14, 15
Manifolds, inta	ke an	d Ext	hua	st															16, 17
Pistons			-																10, 11
Spark Plugs							Ž.		1		-		200						6.8
Starting Crank				198							1					5.		19	2. 4
Starting Crank		13.30	1					16.5					3		1				6 to 8
Valves																	•		

#### COMPLETE ENGINE REPLACEMENT

68263 D ENGINE COMPLETE; also includes ACCESSORIES shown in COLUMN 1. 68264 D ENGINE COMPLETE; also includes ACCESSORIES shown in COLUMN 2. 68265 D ENGINE COMPLETE; also includes ACCESSORIES shown in COLUMN 3.

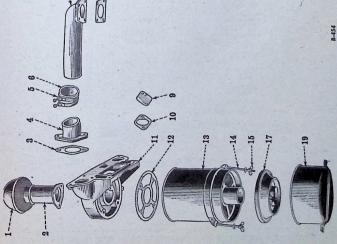
NOTE: The following standard parts are used to attach the above COMPLETE ENGINES.

	Cap screw, 5/8" N.C. x 1-5/8"			6
Q 1878	Cap screw, 5/8" N.C. x 2-1/2"			2
Q 1925	Lock washer, 5/8"			
0 4109	Cap screw, 5/8" N.F. x 3-3/4"			2
Q 1911	Hex. nut, 5/8" N.F			

ACCESSORIES	1	2	3
Cylinder head, complete, and injection nozzles	x	x	x
Oil pan and oil pump	x	x	X
Diesel starting mechanism	x	x	x
Oil level gage	x	x	x
Manifolds	x	x	x
Fan drive pulley and vibration damper			
Flywheel with ring gear and clutch pilot bearing	x		
Water outlet and thermostat housing			
Front engine support with mounting bolts			
Rear engine support with mounting bolts	x	0.000	
		x	
Front engine support shims		x	
Rear engine support dowel bolts and nuts		x	
Hourmeter	X	X	
Thermostats			1
Spark plugs	x	1000	-
Carburetor and starting primer	x	X	
Magneto, magneto coupling and wiring	x	x	
Diesel fuel injection pump with pipes and filter system		x	
Lubrication oil filter	x	x	
Water pump with fan and belts	X	x	
Starting motor		x	1-
Generator and supports	x	x	-
Engine clutch	x	-	-

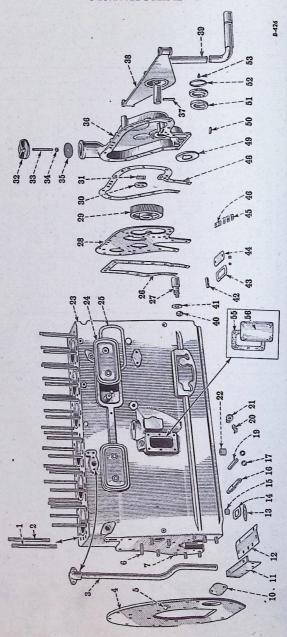
# AIR CLEANER AND CONNECTIONS

No. Wt. Used Lbs.	. 1 31.		1 2.500	- 1		•			.134	125		-	<del></del>		1.500		. 1 .120	. 2 .013		1 .069		38	2 106		5 . L34	1 .235			202	• 4	4	
Description	Air cleaner (includes Ref Nos. 13 thru 19)	Cap screw, 1/2 x 5" N.C Lock washer, 1/2"	intak	pe assembly	crew, 5/8	Lock Washer, 5/8"	Air pipe gasket			Hose clamp (Wittek GM-85)	3/4	[.D.)	pipe,	ew, 5/6 x 1"	Alr pipe gasket	p scre		Lock washer, 1/2"	1	nut	Gasket	alla	Cap screw, 1/2 x 1" N.C.	1/2	Lockwasher 1/8"	· i	sembly	Square nead bolt, 5/16 x	5/16" N.	Screen and baffle assembly Fillister head screw. 17	x 1" N.C	
Donaldson Part No.					:::::::::::::::::::::::::::::::::::::::														:					:::::::::::::::::::::::::::::::::::::::			2P-3752			2P-4891		
I H C Part No.	58200 D		49364 DA		9 4017	0 1920	28210 D		( ( ( ( ( ( ( ( ( ( ( ( ( ( ( ( ( ( ( (	1922 G 1922	58209 D		8829 D	0 T805	41638 D 58914 D			0 1922		9 1988	58210 D	2008 U	0 1848		9991 0	58185 D	59416 D			67119 D		
Ref.	:		1	Q		:,	001	0	8	7	0 0		7		<b></b> 0	,			•		97	1				12	13	14	454 1.5	17		



# Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

#### CRANKCASE



Don't order parts from the illustrations only; refer to the list also.

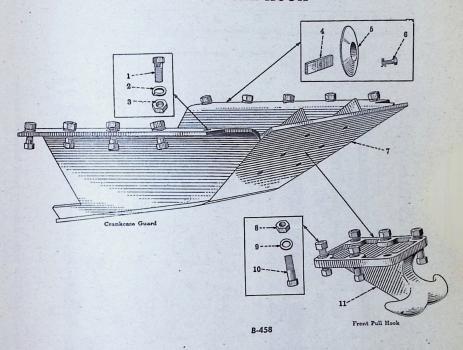
#### CRANKCASE - Continued

							) II		74.	EZC	בו		_		201	ILLI.	LLU	ieu											
Wt. Lbs.				.875	.048	200.	290.	1.125	1	13.750		901.	7.625	.328	030	.062	.750	.031	.046		000 07	40.000	.148	.013	196	25.000			1
No. Used		٦	7	Q	4	CV F	-	٦		٦,-	1	വ	-	1	0	2 ⊢1	٦,	-1,-	ı		,	7	o 0	ņ	-	11	٦,	-	
Description	Crankcase with plugs, studs and camshaft		oquare nead pipe piug,	Side plate	Cap screw, 3/8 x 7/8" N.C.	Gasket	rront plate gasket Idler gear shaft with	pin	ω,	Front plate.			inter gear with bush-	Thrust washer	Cap screw, 5/16 x 3/4" N.F.	Cap screw lock	Oil filler cap	Hex. nut, 3/8" N.C.	Strainer	Front cover includes ref. nos. 31, 51,	52 and oil flinger	Cap screw, 1/2 x		Lock washer, 1/2".	Starting crank ratchet	Front engine support .	Pipe nipple, 1/8x2".	7	
I H C Part No.	6542 DEX			0	0 4017	39757 D	25366 DAX	_	38814 DX	32367 DAX	0 1848	אמת מארפפ	שמת הדרכץ	7	0 1773	25130 D	3713 DA	28940 D	1242 DB	ул 97,63		0 1854		0 1922	30624 D	42709 DX			naée.)
Ref. No.	23			24		252	02	24	2	28	:	00	63	30	:	31	32	34	35	26					22	28			n next
Wt. Lbs.	.687	2	2.750		.005	49.000	300.		10	CZT.	.127	.062	300.	.030	.003		.045	090	• 005	390.	₹00.		.437	.007	195	-077		,	Continued on next page.
No. Used	23	o	۰,	(	23 03	٦,	-1	ά	-	=	1	∞-	4	Q	∞ ⊢	1	ທ	Q	oz i		н	Q	1	4	-	14	,		1000
Description	Cylinder head stud,		Breather pipe	Cap screw, 3/8 x	Lock washer, 3/8".		Flat head rivet,	3/16 x 3/4"	Rear engine support	Hex. nut. 5/8"	N.F.	Dowel pin	Cap screw, 5/16 x		Lock washer, 5/16"	Cap screw, 3/8 x	• 0	Cap screw, 5/8 x 1-1/4" N.C.	Lock washer, 3/8".	Dust seal gasket	Gasket	5/4"	sleeve	Washer	Oil filter return	Drain cock	Drain cock elbow,	7/8"	
I H C Part No.	39810 D	42717 D	55307 DX	0 1804	0 1920	42707 DAX			42718 DB	0 1911		25086 DA	0 4014		Q 1919 G 2773	Q 1799		Q 1804	0 1920	42714 D			46262 J	62866 D	46351 D	31729 D			
Ref.	1	οũ	63			41 п	:		9	:		20	3:		::-	1:				225	14	15	97	17	13	20	21	22	

#### CRANKCASE - Continued

Wt. Lbs.	.250	.064			.031	.005	125		127	ето.			.033						.048	.005		030		
No. Used	4	r	,	7	-	г	Ç	1	OX C	V	1		-	1		٦	-	1	cz	CV		-	1	11
Description	Oil header plug,	Oil header plug,	L/4"	bracket stud	Hex. nut, 3/8" N.F.	Lock washer, 3/8".	dowel bolt,	Hex. nut, 5/8"	N.F.	Distributor hole	lock washer	Cap screw, 5/16 x	5/8" N.C	nlip 1-7/8"	Magneto drive meter-	ing plug	Push rod chamber	Can sorem 3/8 x	7/8" N.C.	Lock washer, 3/8".	Crankcase camshaft	pearing ping,	Rear engine support	stud nut lock washer
I H C Part No.	50410 DA	50474 DA	53643 D		0 1905	Q 1920 62863 D		0 1911		13897 D		9 4012	ת שמשטפ	Cocky	38028 DM		39763 D	7107 0		0 1920	21826 H		47415 H	
Ref.					:	::				:				:	:		:		:	:	•		:	
Wt. Lbs.	.201	1062	.125	.312	.045	.005	390.	250	.062	. 250		.015	.012	1.075	.052	.005	000	.00%	.046	.250		.020	900	
No. Used	ЧЧ	170	₩	٦	C.	03 10		1 ~	1-10	∾ പ		7	٦,	1	4	4		0	4	1		CV	as   red'd	
Description	Starting crank Nut. 3/4" N.F	Nut lock	Dowel	Plate	Cap screw, 3/8 x 3/4" N.C.	Lock washer, 3/8".	Screw strip	Oil flinger.	Oil pan stud	Felt	Lubricator (Lincoln	No. 5000)	Side cover gasket.	Side cover	I'm N.C.	Lock washer, 3/8".	Water jacket plug,	1-1/2"	oil neader pids,	Oil flinger trough .	Front engine support	("0299")	Front engine support	
I H C Part No.	40875 DAXA	25132 D	25087 D 39762 D	39761 D	0 1800	0 1920 32370 D	39380 D		25954 D	36798 D	0 3615	•	42733 D	1908 1908	POOT A	0 1920		ים מסמסה	d leene	36797.D	45976 D		45977 D	
Ref.	59 40	4:	24 A	44	:	45.	46	49	20	52	52		55	96	• • • • • • • • • • • • • • • • • • • •		:		•	:	:			

# CRANKCASE GUARD AND FRONT PULL HOOK

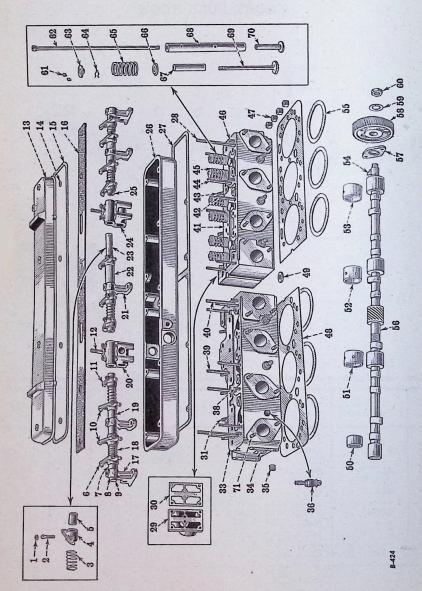


Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.
1 2 3 4 5 6  7 8 9 10 11	Q 1929 42877 D 5977 D 42879 D 42880 DA Q 1920 5980 D	Bolt, 7/8 x 2" N.F. Lock washer, 7/8" Nut, 7/8" N.F. Support Cover Bolt. Cotter, 1/8 x 3/4" Crankcase guard Nut, 7/8" N.F. Lock washer, 7/8" Bolt, 7/8 x 2-3/4" N.F. Pull hook	10 10 10 1 1 1 1 6 6 6	.050 .313 1.125 2.000 .125 .003 180.000 .313 .050

When ordering, always use I H C Part Nos.

#### CYLINDER HEAD, VALVES, ETC.



Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

# CYLINDER HEAD, VALVE, ETC. - Continued

Wt. Ibs.	1.625	3.000	פנו	CTT.			.013	.005		1.562		.172	.062	063.	3.500	080	000.	.115	.005	.250			135,000					140.000		
No. Used	<b>н</b> н	٦	,	11	(	v	cv	4		02 -	1	7	-10	N 4	۲,	,	#	Q	9 -	9			٦					1	Q	
Description	Spacer, center Shaft, center	Front center bracket with stud	Cap screw, 3/8 x	Cup point headless	set screw, 5/16 x	Hex iam nut.		Lock washer, 3/8".		(front and rear).	Cap screw, 5/8 x	3/4" N.C	Housing gasket	Hex mit 1/9" N.F.	old .	Cap screw, 3/8 x	Cap screw, 3/8 x		Lock washer, 3/8".		Cylinder head, rear	(Includes studs	7.5		(Includes studs,	keys, seats, re-	tainers and	ctsk. pipe plug.		
1 H C Part No.		2029 DX	9 1818					0 1920	אחח הדוץ	5970 DX			32457 D	0 1909	59	0 1804	0 1818		Q 1920	54158 D	5968 DAXA		איאת מספא	2000	~					
Ref.	222	24		:				: 1	200	96	:		22	82	53	•			.08	31					22					
Wt. Lbs.	.006	.031		. 500		. 500	.093	.005	ZTO.	.500		.500	10.5	080	20.000	2000	.500	1.000	.031	.031	.156	3.375	715	21.			.013	coo.	.037	
No. Used	122	9		150		K	0 10	02 0	v.	9		3	0	N 0	2 -1	4-		ı Q	03 0	20	4	7		Ħ	,	2	03.	4	10101	0
Description	Nut	Valve lever spring . Valve lever, with	hing,	Bushing	-:	bushing, left	Spacer, outer	Retainer ring	Valve lever. with	bushing, straight	bushing, right	hand	Front center bracket	Stud	/ ' ' · · ·	Washer	relt.	End bracket	Hex.nut, 3/8" N.F.	Valve lever spring .	Spacer, intermediate	with stud	Cap screw, 3/8 x	Cup point headless	set screw 5/16 x	5/4" N.C.	•	Lock washer, 3/8".	diate 3/8" N.F.	Lock washer, 5/8".
I H C Part No.	100000	24961 D 32468 DX		24965 DB			24962 D		32466 DX	39468 DX			32463 D	0001 0			32458 D	5027 DB	0 1905	24961 D		VI 21.60	0 1818					0 1920 FOR D	0 1905	0 1920
Ref.	нα	10 4		ıc	9		7	ω (	10	-	1		12		13	14	1,0	17	:	18	13	O.S.							; :	

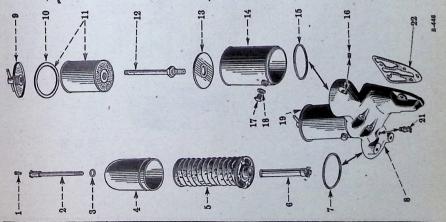
# CYLINDER HEAD, VALVE, ETC. - Continued

Wt. Lbs.	. 250 . 295 . 328	290	680.	27.500	.120	5.250	.062	200.	.437	0000	.375	.343	1.750	.562	.420		787	.250	010	600.	
No. Used	нннг	-ll 0	٥ ٦	ורר	Q	ω <sub>1</sub>		24	122	122	122	15	Z G	စ	23 0	2 .	10	1	16	10	
Description	Bearing, Bearing, Bearing,		(Set of 6) cylinder	Camshaft	. 72	Lock washer, 1/2". Gear (54 teeth)		Valve spring collar.		Upper seat	Valve spring	-	Guide.	Intake valve	Valve tappet	Valve housing cap	Nozzle hody stud nut		Manifold stud	when the meximum of the mean	
I H C Part No.	32282 32282 32281	32280 DCR 13055 D [25090 DD	67228 D	56464 D 5960 D	0 1820	Q 1922 32284 DB	25323 D 58253 D	32485 D			61808 D		4988 D		13043 DB	28813 D	ת ופווצ		50677 D	OTET	
Ref.	5272	53	55	56	:	58	29	19	62	63 64	65	67	68	69	.70	::		: :	7.1	:	
Wt.	.015	.250	-	125	187	690		135,000				140.000	ח ס ר	.031	.250	.187			.031	CZT.	.093
No. Used	14	9	9 1	က ပ ပ	o.	200		-				7	,	0 0	9	1	91	31	02 :	70	21
Description	Expansion plug, 1-1/8", Plug, 1/2"	Spark plug (Champion 44) (optional). Spark plug (AC-18)	(optional).	stud (short) Valve housing stud. Hex.nut. 3/8" N.F.	Bracket stud, inter-	Hex.nut, 1/2" N.F. Cvlinder head, front	(less valves)	נירעה הרשה	(with valves)	(Includes studs, valve guides.	keys, seats, re-	springs)	Valve lever bracket	Hex.nut, 3/8" N.F.	Nozzle body stud	mediate	See detail illus-	Valve lever bracket	stud (short)	Gasket, front and	rear Center stud washer .
I H C Part No.	12000 D	21556 DB		32444 D 0 1905	32448 D	0 1909 F5967 DAXA		FORT DAVA	TOO TOO				32444 D	0 1905	54158 D	7 05-50		32445 D		52454 D 42763 D	32455 D
Ref.	35	- 92	28	29	40	:			41				42	:	43	#	45	46		48	49

# FUEL OIL FILTER AND LUBRICATING OIL FILTER

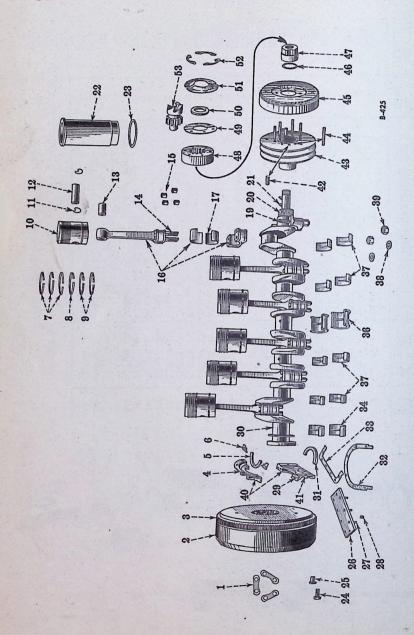
	아내가 내가 보는 경우가 있지만 하다면 하면서 하면서 하는 것이 나를 하는 것이 없는 것이다.
Wt. Lbs.	1.031 2.562 2.562 2.562 2.562 2.000 2.000 1.000 2.260 1.000 2.260 1.000 2.260 1.000 2.260 1.000 2.260 1.0000 1.0000 1.
No. Used	こうこうこうし しんとはしそれるとれるののこととの しょし
Description	Bleeder Stud. Stud. Case. Cloth element Metal element Gasket. Basse with bar assembly and pipe plug. Cap screw, 1/2 x 4-5/4" N.C. Cap screw, 1/2 x 1-1/2" Lock washer, 1/2" Headless ctsk. pipe plug, 3/8". Cover assembly. Cover gasket. Absorption element. Blate assembly. Blate assembly. Case assembly. Drain plug gasket. Drain plug gasket. Lubricating oil filter includes 14, 15, 17, 18 Drain cock. Drain cock. Drain cock. Drain cock. Drain cock.
I H C Part No.	39677 D 39677 D 13839 D 2872 D 2870 DA 28809 D 13841 D 5990 DAX 0 1852 0 1852 0 1852 0 1922 42356 DA 42356 DA 42356 DA 42369 DA
Ref.	

When ordering, always use I H C Part Nos.



Don't order parts from the illustrations only; refer to the list also.

# CRANKSHAFT, PISTONS, PISTON RINGS, ETC.



Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

# CRANKSHAFT, PISTONS, PISTON RINGS, ETC. - Continued

Wt. Lbs.	26.000	310.003 8.750 8.750 2.125 .005 .006 .078	6.187	.020 1.232 .218 .218 .312 .002 11.000 11.000 11.000 11.000
No. Used	6	128 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	9 9	111 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
Description	Cylinder sleeve and packing ring with piston, rings, pin, and pin retainers	Bolt lock	h pin, pin ret	pins and pin retaine  [ze)  aring  satiae) (two halves)  size) (two halves)
I H C Part No.	* 42695 DA Or 1 64440 D * 42696 DA Or 1 64441 D	24942 D 5958 DAX 51208 H 4995 DA 52507 DB 52508 D 52508 D 52509 D 51458 D 42694 D 42694 D 42694 D 42694 D	9323 5957 5957 01	164444
Ref.	: :: :	このなよららでのり	10	11.22.1.24.1.25.1.25.1.25.1.25.1.25.1.25

#### CRANKSHAFT, PISTONS, PISTON RINGS, ETC. - Continued

Wt. Lbs.	1.593 1.593 1.593 1.585 2.625 2.003 2.005 2.005 2.006	4.625
No. Used	- 10000000144000011111111111111111111111	2 1 2 1 3 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3
Description	teeth).  ruff No.  th ring.  sher, 3/8 x sher, 3/8 x sher, 3/8 d.  t with nu t with nu t with nu t with nu f sta ring (.03 rin	Stud nut.  Oil seal retainer.  Cap screw, 5/8 x 5-1/2" N.C.  Washer, 15/52 I.D. x 3/4" 0.D. x 14 gage.  Cap screw, 5/8 x 1-5/8" N.C.  Lock washer, 5/8"
I H C Part No.	25134 DA 47487 D 52502 DCRX 4222 D 52532 D 52532 D 52532 D 52503 D 525	29423 D 29401 D 0 4018
Ref.	012 02 02 02 02 02 02 02 02 02 02 02 02 02	40

# CRANKSHAFT, PISTONS, PISTON RINGS, ETC. - Continued

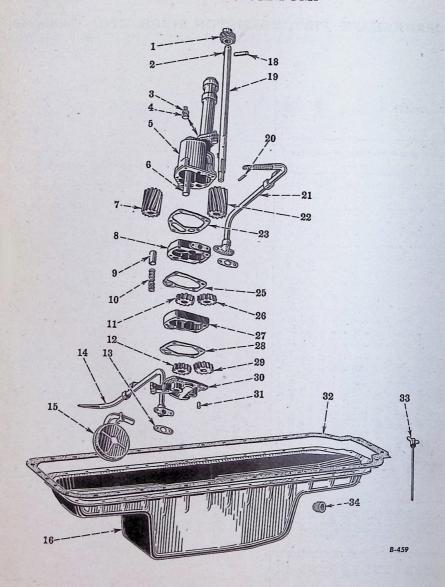
2.750	.031 16.000 .062	.062
. નજન	994446	ผผาผา
Crankshaft rear oil seal lower retainer Pin	Stud.  Hex. mut, 3/8" N.F.  Vibration damper.  Lock washer  Nut  Coupling (11 teeth)  Shaft retainer.  Felt washer	Felt retainer.  Lock
4994 DAX 47490 D 6517 DX	47489 D 47489 D 36794 D 18767 D 6516 D 47481 D 47491 D	47493 D 36795 DA 57624 D 63282 D PO 9696
434	44.45. 44.45. 50.44.48. 50.44.48.	

\* - Designates aluminum pistons.

† - Designates grey iron pistons.

\*\*NOTE: Use only one type of piston (aluminum or grey iron) in any one engine.

#### LUBRICATING OIL PUMP

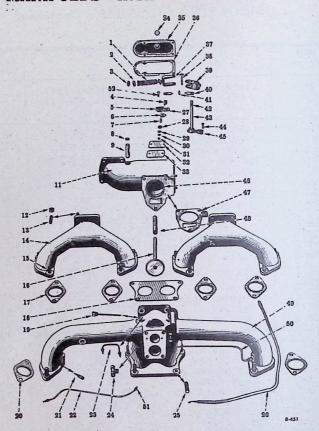


Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

# LUBRICATING OIL PUMP - Continued

Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.
	42794 D	Lubricating oil pump (includes Ref. Nos. 1, 2, 5 thru 12, 15, 18, 19, and 22 thru 31)	1	37.000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 18 19 20 21 22 23 25 26 27 28 29 30 31 32 33 34	46054 DA 13021 D Q 1922 10961 D 5981 DX 42786 D 50336 D 5982 DAX Q 1808 Q 1920 45285 DA 48695 D 51516 D 42792 D 43003 DX Q 1774 Q 1919 42791 DA 64047 D Q 1920 Q 1905 5312 T#3 42783 DXB 32319 D 42783 DXB 32319 D 42783 DXB 32319 D 42790 D 51515 D 5984 DX Q 1920 Q 1920 Q 1920 Q 1920 Q 1920 Q 1920 D 50335 D 42789 D 42790 D 51515 D 5984 DX Q 1818 Q 4019 Q 1920 46052 D 42795 DX 58960 D 46053 D	Pinion (14 teeth) Key (Woodruff No.6) Lock washer, 1/2" Cap screw Body with shaft Countersunk pipe plug, 3/4" Idler gear (12 teeth) Housing, upper with dowel pin Cap screw, 3/8 x 1-3/4" N.C. Lock washer, 3/8" Regulating valve. Spring. Auxiliary idler gear (12 teeth) Gasket. Oil return pipe, front. Cap screw, 5/16 x 3/4" N.C. Lock washer, 5/16". Float. Cotter, 1/8 x 1-1/2". Crankcase oil pan, with magnetic drain plug Cap screw, 3/8 x 1-1/4" N.C. Lock washer, 3/8" Hex. nut, 3/8" N.F. Pin Shaft with pin. Pin Oil return pipe, rear Cap screw, 3/8 x 3/4" N.C. Lock washer, 3/8" Body gear (12 teeth) Housing gasket, lower Auxiliary body gear (12 teeth) Housing, lower Cover gasket. Auxiliary body gear (12 teeth) Housing, lower Cover with pin. Cap screw, 3/8 x 3-3/4" N.C. Lock washer, 3/8" Cover with pin. Cap screw, 3/8 x 3" N.C. Cap screw, 3/8 x 3-3/4" N.C. Lock washer, 3/8" Dowel pin Crankcase oil pan gasket. Oil level gage Magnetic drain plug Upper housing dowel pin	1 2 2 1 2 2 1 1 1 2 2 1 1 1 1 1 1 1 1 3 1 4 1 1 1	2.562 .003 .003 .500 3.000 .003 .500 2.500 2.500 .115 .146 .005 .062 .125 .593

# MANIFOLDS - INTAKE AND EXHAUST



Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.
	65810 D	Intake manifold and air valve housing (complete with carburetor as listed in Section 8, pages 4 and 5)(Also includes Ref. Nos. 1, 2, 3, 8, 9, 11, 16, 19, 21, 22, 23, 24, 34 thru 43, 46, 47, 49, 50 and 51.).	-	,
1 2 3 4 5 6	42663 D 42665 D 42664 D 42673 D Q 1916 42674 D 42676 D	Spring. Cup. Washer. Switch contact. Slotted screw, No. 10 32 x 3/8" Lock washer, No. 10 Spring. Insulator  (Continued on next page)	1 2 1 1 2 2 1 1	.218 .062 .125 .012

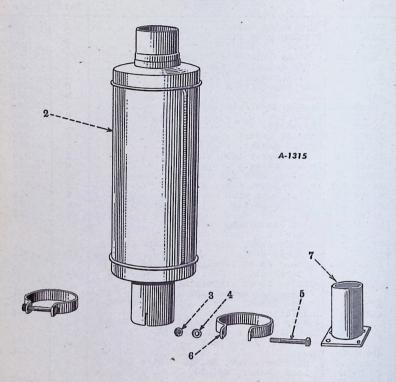
Don't order parts from the illustrations only; refer to the list also.

# MANIFOLDS - INTAKE AND EXHAUST - Continued

Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.
7	42678 D	Insulating tube	1	.002
8	13090 D	Housing plug	1	.015
9	42669 D	Pivot	1	.281
11	5953 DX	Housing (includes Ref. Nos. 8,46 and 47)	1	19.000
	Q 1832	Cap screw, 7/16 x 1-1/4" N.C	3	.084
::.	Q 1921	Lock washer, 7/16"	3 8	.01
12 13	25122 D	IS+nd	8	.062
14	5046 DBX	Exhaust manifold	2	13.250
15	25125 D	Stud, 1/2"	8	.062
16	10000 D1			.937
17	32360 D	Exhaust gasket	4	.062
18	32366 D	Center gasket	î	.062
19	43371 DX	Primer spray tube with nut	2	.046
20	32495 D	Exhaust gasket Center gasket Primer spray tube with nut Intake gasket Tube assembly end with nut Primer pipe, L.H., with nut Center pipe with nut Primer pipe tee. Stud, 1/2"	2 2	.062
21 22	42216 DX 43369 DX	Primer pine L. H. with put	1	.010
23	43368 DX	Center pipe with put	2	.010
24	43372 DX	Primer pipe tee	2	.093
25	25125 D	Stud, 1/2"	8	.062
	40000 DA	BHOLC CLICALCING CAPTE		
		sts of:		
	27618 D	Magneto short circuiting cable loom	0	700
26	370477 D	clamp ring	2	.001
	38433 D	terminal	1	.003
	29016 H	Magneto short circuiting cable		
	23010 1	terminal switch end	1	.031
27	42675 D	Reinforcement	1	.062
28	42677 D	Insulating washer	1	.004
29		Washer 13/64 I.D. x 1/2" O.D. x 18 ga.	1	
30	Q 1916	Lock washer, No. 10	2 2	.003
31	42679 D		2	.125
32	42019 D	Slotted screw, No. 10 - 24 x 1/2".	2	
	Q 1916	Lock washer, No. 10	2	
33	42680 D	Gasket	1	.012
34	23007 V	Cover plug · · · · · · · · · · · · · · · · · · ·	i	.018
35	5954 DX	Housing cover with plug	1 4	2.500
	Q 1802	Cap screw, 5/8 x 1" N.C	4	.005
36	Q 1920 42672 D	Housing gasket	1	.012
37	42666 DX	Yoke	1	.500
38	42668 DA	Yoke pin	1	.045
		Cap screw, 3/8 x l" N.C. Lock washer, 3/8".  Housing gasket Yoke pin Cotter, 1/16 x 5/8".	2	.500
39	42670 D	Valve lever, inner	1	.036
	Q 1802	Cap screw, 5/16 x l <sup>n</sup> N.F. Lock washer, 5/16 <sup>n</sup>	1	.003
40	Q 1919 42662 D	Pin retainer	1 2	.062
41	42661 D	Pin	1	.062
42	4167 T	Key	2	
43	42671 D	Shaft	1	.375
44	14611 H	Pin. Control lever, outer	2	.013
45	42782 D	Control lever, outer	1	.250
	Q 1776	Lock washer 5/16#	1	.003
46	Q 1919 42657 D	Ring	Î	.250
47	42659 D	Gasket	1	.012
48	42658 D	Walve sleeve	1	.281
49	9561 DX	Intake manifold	1	30.000
	******	Headless pipe plug, 1/4"	1	071
50	ATTRO DY	Primer end pipe, R.H., with nut	1	.031
	43370 DX	N +	9	1 010
51 52	36092 D 59247 D	Nut	2	.010

Don't order parts from the illustrations only; refer to the list also.

# EXHAUST MUFFLER



Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

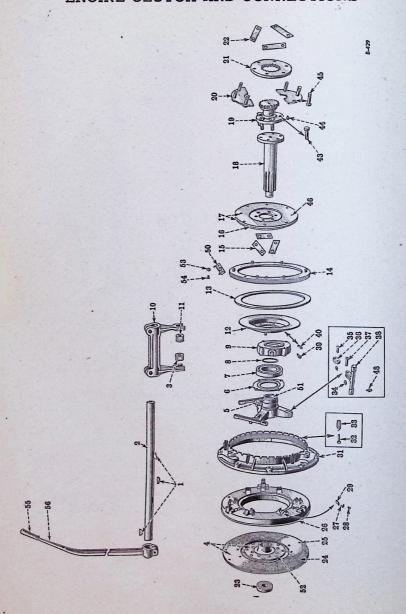
Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.
2 3 4 5 6 7	40142 D Q 1903 Q 1919  U 14284 46644 DX	Muffler	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	5.750 .015 .003 .070 .312 1.750

When ordering, always use I H C Part Nos.

ENGINE CLUTCH

# Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

#### ENGINE CLUTCH AND CONNECTIONS



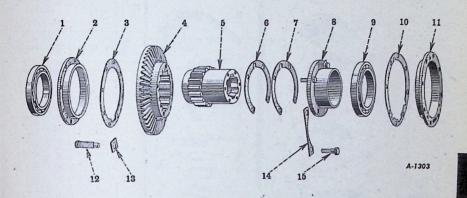
#### ENGINE CLUTCH AND CONNECTIONS - Continued

wt. Lbs.	125.000	9.0062	
No. Used	- 6 6	מחמחח ח	1444111000014441101111011011011001100
Beserlpt18n	Engine clutch (17" over-center) complete.(Includes Ref. Nos. 4 thru 9, 12, 13, 14, 24 thru 40 and 48 thru 54.)  Cap screw, 1/2 x 2-1/8" N.C.  Lock Washer, 1/2".	Key (Woodruff No. 18)	Cap screw, 5/16 x 3/4" N.C.  Lock washer, 5/16" Release bearing (New Departure No. 3214) Ring. Carrier Fork.  Cap screw, 5/8 x 2" N.C.  Lock washer, 5/8" Pin bushing Disc Cap screw, 5/16 x 3/4" N.C.  Lock washer, 5/16"  Adjusting ring.  Ring plate.  Adjusting ring.  Bolt lock Facing.  Coupling washer  Ring (18 teeth) Rough (pilot) (New Departure No. 7306) Facing package (two woven facings) Rivet.
RSSEESEE Clutch No.	CLA-1152-AD	UCL-4156 UCL-4358-1 UCL-4358-1A	CL-4257-1 CL-3919 CL-3920 CL-3920 UCL-4256 CL-3920 CL-3920 UCL-3920 UCL-3897-2 UCL-3897-2 CC-4170 CL-4170
I B S Part No.	40938 DE Q 1922	10450 V 40948 D 42298 DB 45202 D 45193 DAX 45190 DA	45201 DA 41773 () 1919 48175 D 48175 D 48197 DX 5725 DB () 1874 () 1925 48298 DB 48212 DBXA 46198 DB 45212 DBXA 46945 DA 40944 DB 40944 DB 40944 DB 40947 D 40946 D 40947 D 40946 D 40946 D 40946 D 40946 D 40946 D 40946 D 40947 D 40946 D 40946 D 40946 D 40946 D 40946 D 40946 D 43826 D 43886 D 43886 D
Ref. No.	: ::	10 to 4 to 6, 60	84.54.44.45.45.45.45.45.45.45.45.45.45.45

# ENGINE CLUTCH AND CONNECTIONS - Continued

Wt. Lbs.	2000 0005 0016 0016 0020 0030
No. Used	
Description	Plate assembly.  Cam block screw lock.  Sorew, 1/4 x 1/2" N.C.  Sorew, 1/4 x 1/2" N.C.  Back plate.  Bolt.  Lotter, 1/16 x 1/2"  Spring.  Cotter, 1/16 x 1/2"  Spring.  Link.  Link pin, long.  Cotter, 1/8 x 5/8"  Link pin, sbrt 5/8"  Cotter, 1/8 x 5/8"  Link pin, sbrt 5/8"  Coupling bolt  Hex. nut, 1/2" N.F.  Plot lubricator fitting (Lincoln No. 5100)  Dowell pin  Coupling bolt  Hex. nut, 1/2" N.F.  Plot lubricator fitting (Lincoln No. 500)  Ring bolt  Hex. nut, 1/2" N.F.  Plot lubricator fitting (Lincoln No. 5316)  Adjusting lock screw nut.
Rockford Clutch No.	UCI-3894-3 CI-3891 CI-3921 6-CI-3478 UCI-3895-4 CI-5328 CI-5328 CI-5328 CI-4347 CI-4347 CI-4347 CI-43597 CI-43597 CI-43597 CI-43597 CI-43597 CI-43597 CI-4589 CI-5028 CI-5028 CI-5028 CI-5158 CI-5158 CI-5158 CI-5158 CI-5158 CI-5158 CI-5158
I H C	4521246 452246 45226 61136 61136 61128 611
Ref.	85 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8

#### DRIVE BEVEL GEAR

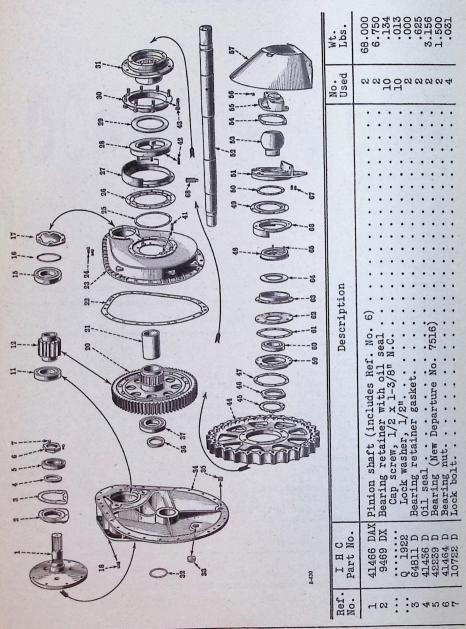


Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

-			The state of the s	
Ref. No.	I H C Part No.	Description	No. Used	Wt. Lbs.
2 3 4	54134 D 8531 D 51238 D 64618 D	Bearing		9.375 7.875 .050
5 6 7 8 9 10 11 12  13 14 15	8530 D 54128 D 54129 D 54130 D 54134 D 51238 D 8532 D 40930 D  40931 D 54132 DA 54131 D	Hub. Shim, heavy. Shim, light. Spacer Bearing. Gasket Cage, right hand Set screw. Hex. jam nut, 1-1/8" Screw lock	as req'd 1 1 1 1 1 1 2 4	.090 .052 12.562 9.000 .017 7.250 .465 .041 .062 .500

When ordering, always use I H C Part Nos.

# SPROCKET DRIVE ASSEMBLY



#### SPROCKET DRIVE ASSEMBLY - Continued

7.108 9.500 9.500 9.500 134 10.812 261.000 200.000 281 200.000 281 162 162 162 163 163 163 164 107 107 107 107 107 107 107 107	11.875 11.875 11.875 11.875 12.200 6.500 6.500 6.500 6.500 6.500 6.500 6.500 6.500 6.500 6.500 6.500
<b>889 888 888 888 888 888 888 888 888 888</b>	80 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Bearing (New Departure No. 1218) Sprocket drive pinion (13 teeth) Bearing (New Departure No. 1219) Bearing (New Departure No. 1219) Packing ring Cap with packing ring. Cap screw, 1/2 x 1-3/8" N.C. Lock washer, 1/2" Spacer, long Gasket Cover with anchor pins Cap screw 5/8 x 2-1/2" Cover with anchor pins Cap screw 5/8 x 2-1/8" Hex. nut, 1/2" Lock washer, 5/8" Lock washer, 5/8" Cap screw, 1/2" Lock washer, 1/2" Lock washer, 1/2" Cap screw, 1/2 x 2" N.F. Dowel pin. Dowel pin. Cap screw, 1/4 x 5/8" N.C.	Gun Gan Gun Gun Gun Gun Gun Gun Gun Gun Gun Gu
44897 D 64807 D 9468 DX 0 1922 64803 D 64812 D 64812 D 64812 D 64812 D 64812 D 0 1922 0 1921 0 1922 0 1922 64804 D 64804 D 64804 D	41604 D 41610 D 9 1980 0 1980 0 1980 1980 D 41609 D 41808 D 40999 D 40999 D 41877 DX 6 19878 6 19878 19889 D
11111111111111111111111111111111111111	256 266 27 27 28 28 28 28 28 28 28 28 28 28 28 28 28

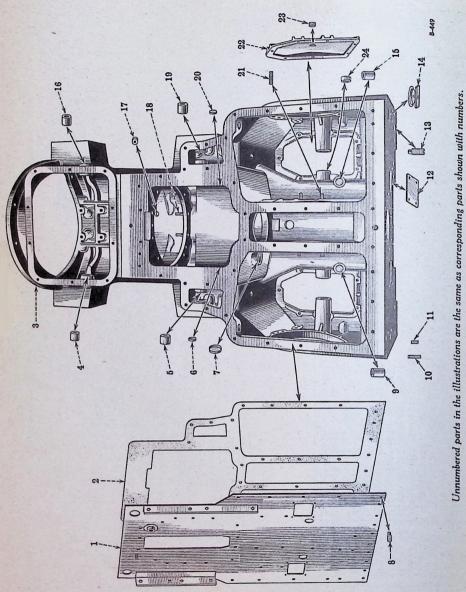
# SPROCKET DRIVE ASSEMBLY - Continued

Wt. Lbs.	.100 .041 .750 263.000	3.375	6.000.9	2000	2.70	33.500	.415	325.000	14.000		16.000	.384	.015	828	.013	.217	14.250	.625	2.250	.013
No. Used	12 16 16	Q Q (	200	2 02	16	യയ	401	24	03 CC	ω	Q1 Q2	ω α	0 00 0	200	ω α	44	W W	2020	2 03 0	290
Description	Anchor pin. Spring. Spring. Supported (99 +seth)	3	Gasket	Diaphragm	Cap screw, 1/4 x 5/8" N.C	t	Cap screw, 3/4 x 2-1/4" N.F	Lock washer, 3/4"	Pivot bearing	118			Lubricator (track pivot) (Lincoln No. 5000)	-	Ex. nut, 5/8" N.F.	-	isher, 1/2	New Departure No. 121	'A	Cap screw, 1/2 x Z" N.F. Lock washer, 1/2"
I H C Part No.	52419 D 41608 D 41876 DA	41878 D 41879 DA	41893 D 5834 D	41612 D 41613 D	Q. 4000 Q 1918	5728 DA Q 1889	0 1891	Q 1927 40997 DA	5727 DA	0 1927	40990 D	0 1890	0 3615	41886 DX	0 1911	0 1864	5876 DA	16135 H 41893 D	41881 D 41894 D	
Ref.	144 42	45	47	50	::	51:	::	• 10.	22	: :	54 77	3:	56	57		::	20:	09	63 8	64

# SPROCKET DRIVE ASSEMBLY - Continued

3.500	107	• 002	.028		.125	.265	.010	.125	.013	.218	•004
<b>ω</b> ω	16	16	4	cv	Q	16	16	16	16	16	8
pring	Cap screw, 3/8 x 3/4" N.C	Lock washer, 3/8"	Anchor pin	Pivot shaft set screw	Hex. jam nut, 3/4" N.C	Sprocket carrier bolt nut	Sprocket carrier bolt lock washer (Shakeproof No. 1134)	Sprocket drive carrier stud nut	Lock washer, 5/8"	Sprocket drive carrier and cover stud	Sprocket drive carrier lock washer (Shakeproof No. 1128)
41619 D 41620 D	0 1800	0 1920	54110 D	40998 DA		41842 D	61913 D	64809 D	0 1925	64810 D	47415 H
65			67	68	:	:	:	:	:	:	

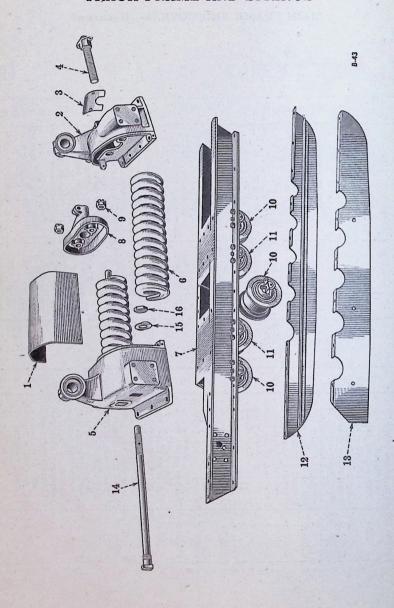
# MAIN FRAME AND COVERS



# MAIN FRAME AND COVERS - Continued

Wt. Lbs.		195	2	.093	.025		.250	17.500	.134	.013		.062	000.1		.025	000.	200	.020	.750		740.			001.				066	.045	.,062	
No. Used	-	. 4	+	cz	-		4	cz	14	14	CV.	Q	C.	2	000	0	(	N.	1		Q	C)		Q		Н	Н	9	9	1	
Description	Socket head pipe	Transmission end	Steering brake lever		Steering brake oper-	Bevel gear bearing	cage stud	spection cover	Cap screw, 1/2 x	Lock washer, 1/2".	Drain plug	cup plug	Steering clutch in-	Cap screw, 5/16" x		Lock washer, 5/16".	spection cover	Magnetic transmission	drain plug, 1-1/2"	Sprocket drive car-	drain plug	Socket head pipe	Steering brake in-	spection cover	Engine clutch com-	partment argin	Power take-off cover.	Cap screw, 5/4 x	Lock washer, 3/4"		
I H C Part No.		41957 D	J 509 D		41600 D	40932 D	200	2000 DA	0 1852	0 1922	4296 DA	בדוחק ה	26011 D	0 1771		Q 1919	7 = 1000	ת ממממק		58997 D			G 87978 D		4296 DA		CZ	6 1884	0 1927	42203 D	
Ref.	17	18	10	CT.	50	21	0	N. N.	:		23	#3	:			:			:	:		:	:		:		:	:	:	:	
Wt. Lbs.			.120	.750	2220.000			967.	.093	.025	100	.125		195	227.	1.000	1.000		7.000	.045	cnn.	.250			.551		.125	100	czr.		
No. Used		-	38	8-1	7	1		-	Q	1		101		,	•	οz	4	•	N	00	0	CZ	C)		cs		-		н		
Description	Main frame cover,	Cap screw, 1/2 x		Frame cover gasket.	Main frame.	Socket head pipe	Engine clutch release	shaft bushing		Steering brake oper-	Reverse idler shaft	Frame cover dowel pin	Steering clutch re-	lease shaft bush-	Drawbar guide bracket	stud, upper.	Drawbar guide bracket	Main frame rear in-	spection cover		Lock washer, 3/8".	shaft set screw.	Hex. jam nut, 3/4"	Steering clutch lu-	bricating port	Steering clutch re-	lease shaft bush-	Engine clutch release	shaft bushing		
I H C Part No.	57100 DXA	0 1850		Q 1922 49559 D	5900 DJX		41598 D	41 599 D		41600 D	46369 D	18585 DA			57387 D		57386 D	42290 D	סטפר		0 1920	40888 DA		42297 D		42000 D		41 598 D			
Ref.	1			•••	3 10	:	4	ď	,	9	7	α	00		10	2	17	12		•	::	7.0		14		15		16	3		

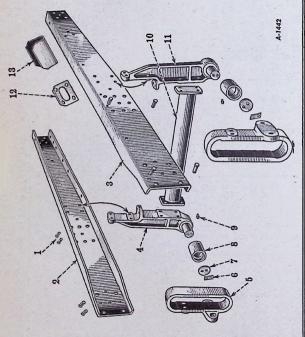
#### TRACK FRAME AND SPRINGS



# TRACK FRAME AND SPRINGS - Continued

Wt. Lbs.	.045 .050 142.000	440.000	.540	.201		000	150.000		194,000	90.000		.259	75.000	0 0	127	17.000			.250	.375	
No. Used	227	110	cι	02 02			0		4	* H -	1	224	427	1 0	100	T 4	4	44	4	4	
Description	washer, 3/4 washer, 7/8	Frame, complete, L.H. Frame, complete, R.H. Retainer, front.	Cap screw, 3/4 x 3-1/4" N.F.	Lock washer, 3/4" Hex. nut, 3/4" N.F	- 0	3, and 5) (See de- tails on Page 2,	plete	less bracket (Nos. 2 and 4) (See details	on Page 2, Section		Cap screw, 5/	Hex. nut, 5/8" N.F.	Shield, inner, L.H.	Cap screw, 5,	Hex. nut, 5/8" N.F.		Cadmium plated castle	Cotter, 3/16 x 2-1/4".	washer.	Spring adjusting rod lock nut	a Rigid Track Frame these parts are replaced.
I H C Part No.	0 1927 0 1929 41843 DA	52425 DD 52425 DD 5865 DA	0 4134	Q 1927 Q 1913	56133 D		56134 D			46683 DAX	0 1873		46681 DAX	0 1873	1911	55339 D		ת נונוא	11170	46887 D	ack Frame
Ref.	::0	r 0	:	:0	10	6 7	11			12			13		:	14:	:		2 6	76	gld Tr
Wt. Lbs.	24.000	901	126.000	.665	.496	999.	.751	.201	040.	.500	177	14.000			152.000	152,000	.665	.496	999.	.313	otth a Ri
No. Used	03 00	00 0	0 H C	ı oz	80	4	4	es a	0 00	9 82	,	440		4	44	7	Q	4	9	03 ~	pbed 1
Description	Guard	l" O.D. x No.14 gage.	Sp	Cap s	Cap screw, 7/8 x 1-3/4" N.F.	Cap screw, 7/8 x 2-3/4" N.F.	Cap screw, 7/8 x	Hex. nut, 3/4" N.F.	100		Cap screw, 3/8 x 5/8"	Lock washer, 3/8".	Cadmium plated cap screw, 5/8 x 1-1/2"	Cadmium plated lock	Re	Re	Cap serew, 8/4 A	Cap screw, 7/8 x 1-3/4" N.F.	Cap screw, 7/8 x	Hex. nut, 7/8" N.F.	e tra
I H C Part No.	41846 D Q 1922	0 1848	\$5866 DBX	0 4138	0 1897	0 4166	0 4168	0 1913	0 1927	18	6 4016	Q 1920			FAGS DDX	[5864 DDX	. 6 4140	. 9 1897	. 9 4166	0 1913	*
Ref.	*		*	•		•	i		::	: 10	:	:4	•			2	:	: .	:		1

### TRACK FRAME GUIDE, ROLLER AND BRACKET MAIN FRAME SIDE CHANNEL



NNEL							
Wt. Lbs.	.250 .050 .051 .051 .051 .045 .045 .045 .045						
No. Used	®1004410044						
Description	Dowel.  Channel, L.H.  Cap screw, 7/8 x E-1/4" N.C.  Lock washer, 7/8".  Cap screw, 5/4 x 2" N.C.  Lock washer, 3/4".  Cap screw, 7/8 x 2-1/4" N.C.  Cap screw, 7/8 x 2-1/4" N.C.  Lock washer, 7/8".  Cap screw, 3/4 x 2" N.C.  Lock washer, 7/8".						
I H C Part No.	42233 D 58194 D 4147 Q 1929 Q 1927 C 1927 Q 1929						
Ref. No.	ни :						

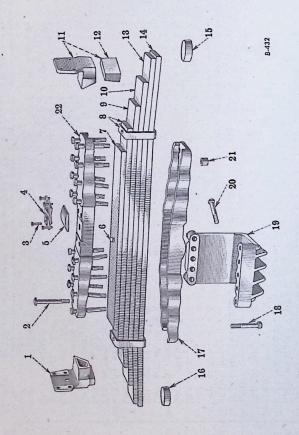
# TRACK FRAME GUIDE, ROLLER AND BRACKET MAIN FRAME SIDE CHANNEL - Continued

.477 .415 .201 .045 .045	.020.020.020	48.000 .384 .384	.045 61.500 .352 .290 .201	.155 .069 .015 1.125 .060 .031 .005	
1040004	4400040	どこままま	<b>日</b> こ 2 4 6 6 6	1222221222244	
					these parts are
					Rigid Track Frame,
Bracket, complete, L.H.  Cap screw, 5/4 x 2-5/8" N.F.  Cap screw, 5/4 x 2-1/8" N.F.  Hex. nut, 5/4" N.F.  Lock washer, 5/4".  Guide.  Cap screw, 7/8 x 2-1/8" N.F.	ock , 1/	Lubricator (Lincoln No. 5000). Bracket brace. Cap screw, 3/4 x 2" N.C. Cap screw, 3/4 x 2" N.F. Hex. nut, 3/4" N.F.	Lock washer, \$74".  Bracket, complete, R.H. Cap screw, \$74 x 8-5/8" N.F. Cap screw, \$74 x 8-1/8" N.F. Hex. nut, \$74" N.F. Lock washer, \$74". Starting grank summer release.	Gap Screw, 1/2 x 1-3/8" N.F. Hex. nut, 1/2" x 1-3/8" N.F. Lock washer, 1/2"	If the tractor is equipped with a
5769 DAX 0 1913 0 1927 41435 DB	Q 1929 35089 DA 41431 D Q 4050 41430 D	Q 3615 41433 DXA Q 1890 Q 1889 Q 1913	6 1927 5770 DAX 0 1913 0 1927 50180 D	0 1909 0 1922 50181 D 0 1926 0 1920 59237 D	*
* *	* * *	oo:::	# #	*	

Don't order parts from the illustrations only; refer to the list also.

#### EQUALIZER SPRING

Note: If the tractor is equipped with a Rigid Track Frame, the Equalizer Spring is not used.

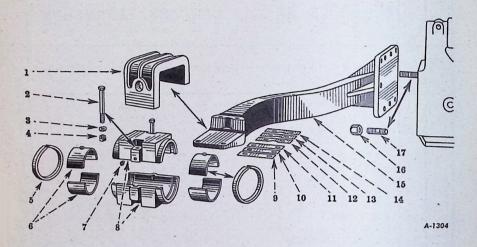


# **EQUALIZER SPRING - Continued**

Wt. Lbs.		24.000 .709 .250 .250 .250 .250 .500 .500 .05 2.000 4.500 4.500 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000
No. Used	-	144044110011111111440111110011000000000
Description	Spring, complete (6 leaves)	Bumper pad bracket with pad, R.H.  Cap screw, 7/8 x 3" N.C.  Lock washer, 7/8"  Lock washer, 5/8"  Lock washer, 5/8"  Dowel bolt, upper.  Lock washer, 5/8"  No. 6 leaf  No. 5 leaf with clip  No. 5 leaf with clip  No. 5 leaf  No. 5 leaf  No. 6 leaf  No. 7 leaf  No. 8 leaf  No. 8 leaf  No. 8 leaf  No. 9 leaf  Cap screw, 7/8 x 5" N.C.  Bumper pad  No. 1 leaf  Cuck washer, 7/8"  Lock washer,
I H C Part No.	41439 D	8942 DX Q 1929 41441 D Q 1925 41445 D Q 1925 41456 D 41456 D 41456 D 41456 D 41456 D 41457 D 41452 D 8941 DX Q 1929 58955 DA 41452 D 41452 D 5777 D
Ref.	·	1 : : %

#### TRACK FRAME DIAGONAL BRACE

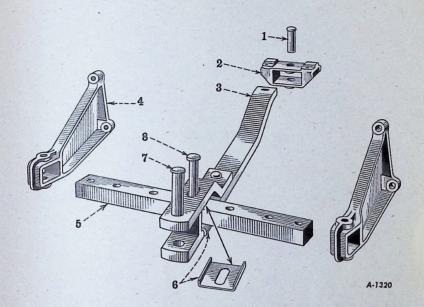
Note: If the tractor is equipped with a Rigid Track Frame, the Track Frame Diagonal Brace is not used



Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

	The same as the same as corresponding parts shown with numbers.						
Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.			
1  2 3 4 5	5897 DA Q 1892 Q 4126 Q 1927 18868 D	Clamp. Cap screw, 3/4 x 2-1/4" N.C. Cap screw, 3/4 x 4-3/4" N.C. Lock washer, 3/4". Bolt, 1/2 x 4" N.F. Lock washer, 1/2" (Shakeproof No. 1124). Nut, 1/2" N.F. Felt	2 4 4 8 4 4 4 4	23.000 .415 .727 .105 .187 .003 .069			
6 7 8 9 10 11 12 13 14 15 16	\$7241 D Q 3615 57237 DA 42130 D 42131 D 42132 D 42127 D 42128 D 42129 D {42005 DA 42006 DA 41842 D Q 1929 63266 D	Bushing (set of 4) Lubricator (Lincoln No. 5000) Bearing. Shim, outer (extra heavy) Shim, outer (heavy). Shim, outer (medium) Shim, inner (extra heavy) Shim, inner (heavy). Shim, inner (medium) Brace, L.H Brace, R.H Nut. Lock washer, 7/8". Stud.	4 4 2 2 2 2 2 4 1 1 1 2 1 2 1 2	.042 .468 .015 18.75 .104 .083 .025 .097 .046 .031 190.000 190.000 .281 .05 .500			

#### DRAWBAR



Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

Ref.	IHC		No.	Wt.
No.	Part No.	Description	Used	
1	41589 D	Pivot pin	1	5.250
2	5831 DA	Bracket	1	. 43.000
	Q 4186	Cap screw, 1 x 3 <sup>n</sup> N.C	4	.969
		Lock washer, 1"	4	.088
3	41595 D	Drawbar	ī	216.000
		Round head rivet, 1-1/4 x 5-1/2"	1 2	210.000
4	5830 DB	Guide bracket	2	38.000
		Lock washer, 1"	6	
		Hor mut 3" N F	0	.088
5	47 507 . DA	Hex. nut, 1 <sup>ii</sup> N.F	6	.442
	41591 DA	Guide	1	103.000
		Cap screw, 1-1/4 x 7" N.F	2	
		Hex. nut, 1-1/4" N.F	2	.837
		Lock washer, 1-1/4"	2	.156
6	41592 D	Plate	2	2.625
7	41593 D	Clevis pin	1 7	~.020
		Cotter, 1/2 x 3"	1	
8	41594 D	Stop pin	1 7	3.500
		Cotter, 1/4 x 2-1/4"	1 1	.022
			-	·UEE

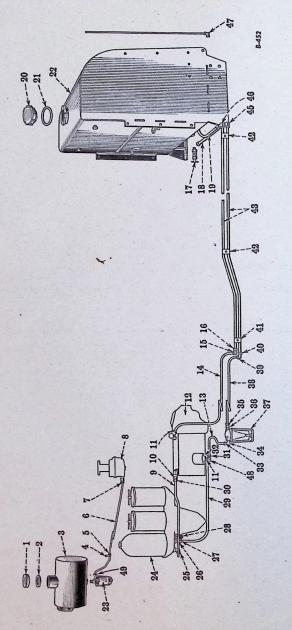
# SPARE PARTS CATALOG

# MEMORANDA

# FUEL SYSTEM

													Page No.
Carburetor		•	•	•	•	•	•		•		•		4 to 6
Fuel and gasoline tanks and piping			•	•				•		•		•	2, 3
Fuel injection pump		•	•	•			•						10 to 12
Fuel supply pump	•		•	•		•						•	13
Gasoline strainer assembly	• •		•	•			•						7
Governor unit			•	•	 ٠					•			14 to 17
Injection pump and connections			•		 •		•	•	•		•	•	8, 9
Water trap	•												7

#### FUEL AND GASOLINE TANKS AND PIPINGS



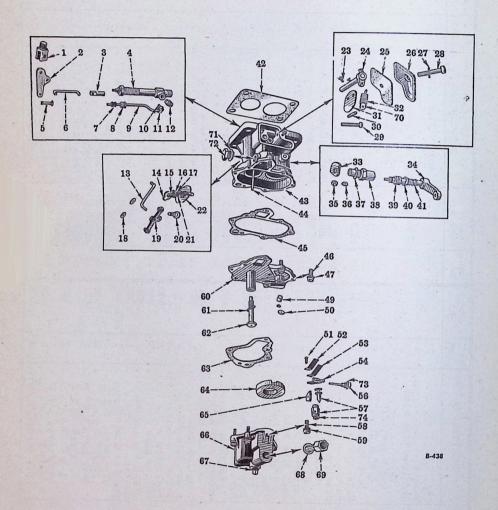
Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

#### SPARE PARTS CATALOG

# FUEL AND GASOLINE TANKS AND PIPINGS - Continued

Wt. Lbs.		2.375 .031 .031 .035 .031 .035 .031 .035 .031 .035 .037 .037 .037 .037 .031
No. Used		י ארטים ממממים אים י
Description	Stand Gasol (I N Fuel Elbow Pipe Coupl Coupl Gubl	Coupling nut. Coupling nut. Coupling nut. Fuel pipe with coupling nuts. Coupling nuts. Coupling nut. Elbow with nut. Clamp. Clam
I H C Part No.		77523 DX 37165 D 56081 DX 56081 DX 37165 D 42406 DX 42885 D 0 1805 0 1805 0 1805 0 1805 0 1805 1823 D 48232 D 48232 D 48232 D 48232 D 48232 D 48232 D 28899 D 29899 D
Ref.	83 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3	25 25 25 25 25 25 25 25 25 25 25 25 25 2
Wt. Lbs.	.250 .015 .045 .005 .005 .000 .781 .025 .025 .500	.031 .031 .031 .031 .031 .500 .500 .500 .500 .035 .031 .031
No. Used	<u> </u>	ממ א המחחחחחח ממ מ שם
Description	Gap Gasket. Gasoline tank with cap. Cap. Screw, 3/8 x 3/4" N.C. Lock washer, 3/8" Clip. Felt. Gasoline pipe with Gasoline pipe with Coupling nuts. Coupling nuts. Carburetor Fuel pipe with coupling nuts.	Coupling nut.  Injection pump. Fuel pipe with coupling nuts. Coupling nuts. Coupling nut. Elbow with nut. Valve Fuel pipe Return pipe Cap
I H C Part No.	DA DOX SOO SOO SOO SOO SOO SOO SOO SOO SOO S	DX DX DX DDX DDB DDB DDB DDB DDB DDB DDB
Ref.	1000 - 400 C	11111 1 111111111111111111111111111111

#### CARBURETOR



#### CARBURETOR - Continued

Ref.	I H C Fart No.	Description	No. Used	Wt. Lbs.
	42870 D Q 1802 Q 1920	Carburetor (as illust., less Ref. Nos. I to 6, 10 to 12 and 42) (Model C-12) (1-1/4")	   4   4	5.000 .052 .005
1 2 3 4 5  8 9 10 11 12 13  14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 28 29 30 30 30 30 30 30 30 30 30 30 30 30 30	42775 D 42774 D 42772 D 42771 D 67943 D 14611 H 42773 D 32896 D 32895 D 20684 D 20683 D 32948 DX 42869 D 42863 D 27452 D 32590 D 14581 D 32592 D 42867 D 42868 D 31636 D 32589 DX 14971 D 32602 DAX 32607 DA 32600 D 32599 D 32601 D 32599 D 32601 D 27435 D 32582 D 42871 D	Bell crank support Bell crank Rod end. Primer assembly (includes Ref. No. 12) Primer (body only) Pin Cotter, 1/16 x 7/16" Rod Cotter, 1/16 x 7/16" Tube packing Tube gland Inlet tube Connector sleeve Connector nut. Inlet valve. Inlet valve (includes Ref. Nos. 10, 11) Connecting rod Cotter, 1/16 x 1/2" (cad. plated) Shaft and lever Packing spring Retainer Packing. Washer Bell crank Screw. Butterfly screw. Shutter assembly Butterfly screw Throttle shaft Gasket Cover. Screw gasket Clamp screw. Stop pin Butterfly. Spring Cam. Shaft and lever. Type "B" hex. nut, No. 8 - 32 (cad. plated) Lock washer for No. 8 screw (cad.	11112211111112111221121212111111211	.093 .250 .125 .500 .013 .125 .000 .020 .037 .001 .078 .012 .025 .046 .003 .001 .001 .001 .001 .001 .078 .001 .001 .001 .001 .001 .001 .001 .00
36 37 38	58836 D 32585 DA	plated)	1 1 1	.003

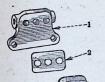
(Continued on next page)

#### SPARE PARTS CATALOG

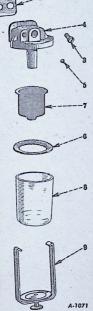
#### CARBURETOR - Continued

Ref.	I H C	Description	No. Used	Wt.
210.	1010 1101			
39	32588 D	Dust washer	2	.031
40	32587 D	Spring	i	.002
41 42	32586 D 42769 D	Gasket	i	.010
43	5049 DAX32	Body with bushings and plugs	ī	2.562
44	32614 DX	Tube	ī	.006
45	32597 D	Gasket	1	.012
46	0.00012	Lock washer for No. 12 screw (cad.		
		plated)	3	
47		plated)		
		l nlated)	3	
49	27445 DB	Drip hole filler	Ţ	.001
50	57957 D	Plug	1	.002
51		Screw, No. 4 - 36 x 7/16" (cad.	1	
=0	32578 D	plated)	i	.002
52 53	32577 D	Spring, lower leaf	i	.001
54	32575 D	Float lever	i	.015
56	32576 DX	Float pivot screw	ī	.010
57	32581 DXA	Valve cage assembly.	ī	.031
	J	Screw. No. 12-24 x 3/4" (cadmium plated)	1	
58	N	Screw, No. 12-24 x 1" (cadmium plated)	4	
59	1	Lock washer for No. 12 screw (cad. plated)	5	
60	5975 DX	Bottom plate (includes Ref. Nos. 49 and	3	
		50)	1	.718
61	32615 D	Gasket	1	.000
62	32616 D	Metering well	1	.025
63	32606 DA	Gasket	1	.007
64 65	32572 DAX	Float with ferrule	1	.031
00	32574 D 5051 DX	Plate	1	.750
	35691 DX	Bowl, complete with adapter (includes	7	. 150
66	ROOGE DE	Ref. Nos. 52 to 57, 64, 65, 68, 69,		
		and 74)	1	.968
67		Steel pipe plug, 1/8" (cad. plated)	1	
68	18377 D	Strainer screen gasket	1	.003
69	29902 DX	Screen retainer	1	.046
70	27436 D	Spring end	1	.004
71	18377 D	Plug gasket	1	.003
72	42844 D	Plug	1	.031
73	25948 D	Float lever pivot screw gasket		.000
74	25948 D 25969 DA	Needle valve cage gasket		3.500
	32604 D	Float lever spacer	The state of the s	0.000
	53079 D	Float and lever assembly		.041
	58836 D	Locking shaft bearing gasket	ī	
	1		1	

#### WATER TRAP

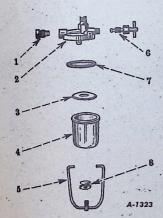


When ordering, always use I H C Part Nos.



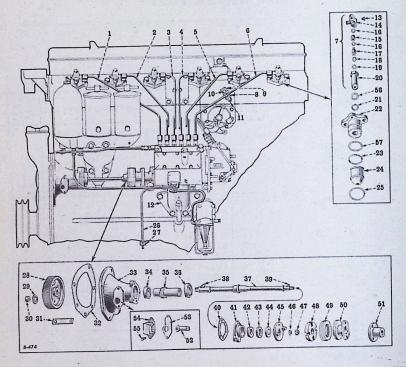
Tritoit order trigg alloady door 111 of art 11001								
Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.				
	60870 D Q 1864 Q 1922	Water trap (Includes Ref. Nos. 2 thru 9)	 	2.43				
1  2 3 4 5 6 7 8 9	8221 DA Q 1802 Q 1920 51527 D 60871 D 9118 DX 24805 D 68070 D 60872 D 60877 D 60878 DX	Cap screw, 3/8 x 1" N.C Lock washer, 3/8". Gasket Vent screw	1 22111111111	.875 .052 .005 .007 .021 1.187 .001 .005 .125 .718 .125				

# GASOLINE STRAINER ASSEMBLY



Ref. I H C		Description	No. Used	Wt. Lbs.
•••	51066 DBX	Gasoline strainer, complete	1	.687
12345678	51344 V 17564 D 52855 D 68367 D	Coupling nut Top or body	1 1 1 1 1 1 1 1 1	.025 .250 .006 .312 .062 .020 .001

# INJECTION PUMP AND CONNECTIONS

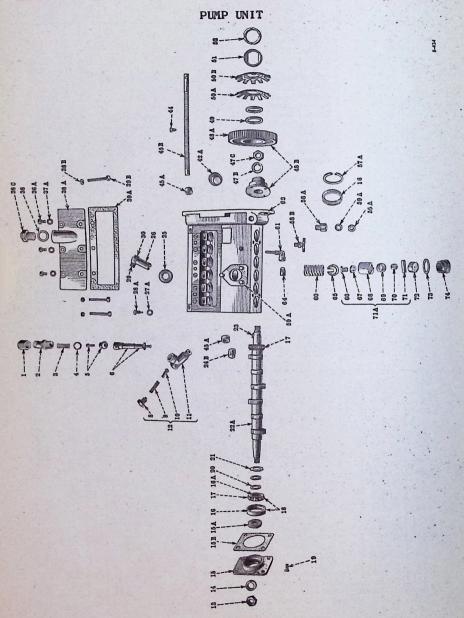


Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.
	Q 4017 Q 1920 54910 D	Injection pump (includes pump unit, governor and fuel supply pump) (see detail lists) (pages 8 to 15)	     	55.000 .048 .005 2.437
1 2 3 4 5 6 7 8 9 	54911 DX 54912 DX 54913 DX 54914 DX 54915 DX 54916 DX 52913 D 27927 DA [42799 D [42799 D [42799 D] [42799 D] [4279 D] [4270 D] [42	Pipe (No. 1) Pipe (No. 2) Pipe (No. 3) Pipe (No. 3) Pipe (No. 5) Pipe (No. 6) Nozzle (Ref. No. 13 thru 20) Washer Clip, rear Cap screw, 3/8 x 3/4" N.C. Lock washer, 3/6" Nut, 5/16" Bracket. Cap screw, 1/2 x 1-1/2" N.C. Lock washer, 1/2"	1 1 1 1 6 2 1 1 2 2 2 2 2 1 4 4	.406 .375 .375 .406 .406 1.375 .062 .125 .093 .045 .005

# INJECTION PUMP AND CONNECTIONS - Continued

Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.
13	32493 D	Bleeder valve	6	.031
14	52612 D Q 1809	Nozzle fitting	6	.593
15	37150 D	Cap screw, 3/8 x 2" N.F.	12	.084
16	37148 D	Spacer	6	.046
17	37152 D	Valve and spring assembly	6	.140
18	43192 DA	Plate.	6	.218
19 20	37148 D 42766 D	Gasket	6	.062
21	42767 D	Nozzle body	6	.468
22		Nozzle body gasket	6	.007
23	42765 DA 43002 D	DDacer gasket	6	2.187
24	56291 D	Spacer	6	.515
25	43002 D	Spacer gasket	6	.023
26	61407 DX	Injection pump overflow pipe with		
27	52128 D	coupling nuts	1	
		Washer, 13/32 I.D. x 3/4" O.D. x 16 ga.	1 1	.020
28	25362 D	Gear (54 teeth)	i	4.750
29	25354 D	I NUL TOCK	ī	.062
30 31	32341 D	Nut, 3/4"	1	.201
32	32340 D	Housing gasket	1	.062
33	5005 DAX	Housing with plug	1 1	.031
		Cap screw, 1/2 x 1-7/8" N.F. Cap screw, 1/2 x 1" N.C. Cap screw, 1/2 x 3-3/4" N.F. Cap screw, 1/2 x 1-3/4" N.C. Hex. nut, 1/2" N.F.	2	.162
	Q 1848	Cap screw, 1/2 x 1" N.C	2	.106
	Q 4053 Q 1854	Cap screw, 1/2 x 3-3/4" N.F	1	.259
	Q 1854 Q 1909	Cap screw, 1/2 x 1-3/4" N.C	1	.148
	0 1922	Lock washer, 1/2"	3 4	.069
34	[10701 DA	Bearing (New Departure No. 7505) (optional)	ī	.281
	LST 213	Bearing (IHC) (optional)	1	
35	49453 DX [23874 D	Hour meter drive gear	1	1.250
36	ST 208	Bearing (New Departure No. 3206) (optional) Bearing (IHC) (optional)	1 1	.457
37	32345 D	Shaft	ī	2.500
70	4010 5	Cotter, 3/32 x 7/8"	1	.002
38 39	4710 D 7220 T	Key (Woodruff No. 15)	1	.062
40	32342 D	Gasket	1	.007
41	5006 DAX	Cap with felt and felt retainer	ī	.937
	Q 1804	Cap screw, 3/8 x 1-1/4" N.C	1	.060
42	Q 1920	Lock washer, 3/8"	3	.005
43	12480 L 32362 D	Oil seal	1	.085
44	32343 D	Felt retainer	i	.031
45	\$32346 DAX	Flange with pin	1	1.125
	[G 3836	Dowel pin	1	.002
46 47	32347 D Q 1909	Washer	1	.062
48	31439 DB	Spacer	1	.250
49	31439 DB 31441 D	Boot	î	.250
50	33275 D	Adjuster	1 2 2 1	1.750
	Q 4020 0 1920	Cap screw, 3/8 x 5/8" N.F	2	.045
51	Q 1920 54909 D	Lock washer, 3/8"	2	1.125
52	49454 D	Hour meter driven gear assembly	i	.500
53	49451 D	Hour meter gasket	1 1 2	.250
54	49450 D	Hour meter	1	1.125
55	Q 1918 23086 D	Hour meter can screw	2 2	.002
56	61208 D	Hour meter cap screw	6	.007
57	61209 D	Nozzle body retainer dust seal	6	.005
	29898 D	Nozzle body retainer dust seal Injection pump overflow pipe nut	1	.015
• • •	64121 D	Injection pump overflow pipe clip, upper	1	.015

# DETAIL PARTS OF FUEL INJECTION PUMP - Continued



# DETAIL PARTS OF FUEL INJECTION PUMP - Continued PUMP UNIT - Continued

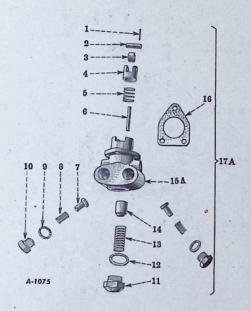
Wt. Lbs.		0000 0000 0000 0000 0000 0000 0000 0000 0000	
No. Used	-	а в в в в в в в в в в в в в в в в в в в	
Description	Pump unit, complete (less Ref. Nos. 8 thru 12 and 47C thru 55).	Delivery valve holder protection cap.  Delivery valve holder  Delivery valve spring.  Delivery valve spring.  Delivery valve sate  Delivery valve sate  Delivery valve sate  Delivery valve holder  Delivery valve and seat  Plunger and barrel.  Valve screw  Valve screw  Valve screw  Valve complete.  Camshaft hexagon nut.  Iock washer, 1/2"  End plate gasket.  End plate gasket.  End plate gasket.  Camshaft bearing inner race  Camshaft bearing inner race  Camshaft bearing gasher  Camshaft bearing washer (0.10 m.m.)  End plate fastening screw  Bearing adjusting washer (0.15 m.m.)  End plate fastening screw  Camshaft clast profile No. 2)  Camshaft key (Woofruff)  Camshaft key (Woofruff)  Control sleeve.  Camshaft key crew gasket  Control sleeve.	(Montinued on next page)
Bosch Part No.		HAND 9A EX HP 7684 BP 7684 BP 7684 BP 7686 BC 7661-8A BC 7686 WEF 2177/1X PVB 48A/1X VA 76838 VA 76838 VA 76838 VA 76838 PK 764 PK 764	
I H C Part No.	0 01619	40255 D 54526 D 54526 D 54536 D 54537 D 64040 D 40401 D 40539 DA 54537 D 54537 D 54290 D 6496	
Ref.	:	20 00 00 00 00 00 00 00 00 00 00 00 00 0	

#### SPARE PARTS CATALOG

# DETAIL PARTS OF FUEL INJECTION PUMP - Continued PUMP UNIT - Continued

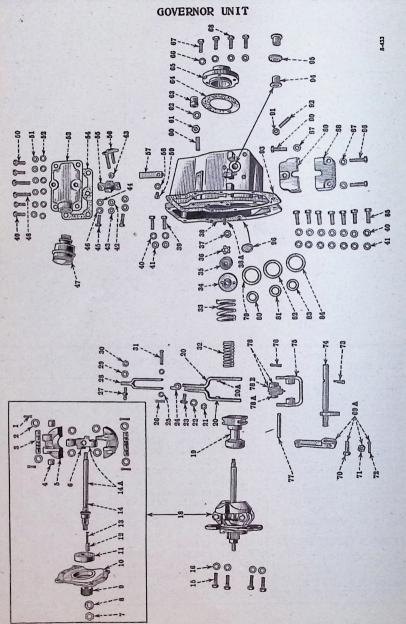
Wt. Lbs.	
No. Used	
Description	Oll filler plug.  Inspection cover gasket.  Inspection cover fastening screw, Control rod scenting screw Drive gear hub mut Drive gear assembly.  Adjusting spacer (.025) Adjusting spacer (.026) Drive gear adjusting mut lock washer Drive gear adjusting mut lock washer Drive gear adjusting mut Hexagon mut, 1/4" N.C. Drive gear adjusting nut Hexagon mut, 1/4" N.C. Drive gear adjusting nut Hexagon mut, 1/4" N.C. Drive gear adjusting nut Hexagon mut, 1/4" N.C. Bearing relainer ring. Lubricating oil drain plug Lubricating oil drain plug Lubricating oil overflow connection. Plunger spring Lubricating oil overflow elbow nut Plupe plug, 3/8" Lubricating oil overflow elbow nut Plupet screw lock nut. Tappet roller Tappet plug, 3/8" Lappet long gasket Closing plug gasket Closing plug gasket
Bosch Part No.	PG 7681 GA 76117 BG 7661 BG 7661 BG 7661 BG 7661 BG 7665 WA 2185/1X BG 7685 WA 5-16CA NT 7921 GE 7918 GE 7918 GE 7918 GE 7918 GE 7918 GE 7918 GE 7918 GE 7918 GE 7918 GE 792 DC 795 DC 7
I H C Part No.	62117 D 62119 D 62119 D 62121 D 62129 DX 54200 D 61964 D 61964 D 61964 D 62199 D 62199 D 62195 D 62195 D 62195 D 62195 D 62197 D 62196 D
Ref.	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4

# DETAIL PARTS OF FUEL INJECTION PUMP - Continued FUEL SUPPLY PUMP



Ref.	I H C Part No.	Bosch Part No.	Description	No. Used	Wt. Lbs.
1	43189 D	PN 797	Tappet securing pin	1	.001
2 3 4 5 6 7	40388 D	WB02174/1X	Tappet wrist pin	1	.021
8	40390 D	WRL2004/1X	Tappet roller		.062
4	40386 D	PVE46/1X	Tappet shell		.062
5	40395 D	WSF2197A1X	Tappet spring	1	.006
6	:::::::		Spindle (order 62126 DY)		.004
	40385 D		Inlet or outlet valve	2	
8 9	54371 D	WSF2196/4X	Valve spring	2	.006
9	62129 D	WMR2041/404X	The state of the s		
70	10000	).UUT0000 /2.77	gasket		
10	40397 D	WVU2097/1X	Valve spring retainer screw	2	.077
11	54367 D	SC7919A	Plunger spring retainer screw		
12	61111 D	WMR2041/2X	with plug	1	.082
12	OTITI D	WILLSOUT / SY	Plunger spring retainer screw		
13	54366 D	WSF2216A/1X	gasket		07.5
14	54566 D	WDF ZZIOH/IA	Plunger spring	1	.015
15A	62126 DY		Plunger (order 62126 DY) Fuel supply pump housing with	1	
LOR	ONTRO DI		plunger and spindle	1	010
16	54364 DB	GA 76120	Fuel supply pump housing gasket .		.812
17A		AFP/K16NK522			2.250
-			race supper pump, comprese	1	2.200

### DETAIL PARTS OF FUEL INJECTION PUMP - Continued



### DETAIL PARTS OF FUEL INJECTION PUMP - Continued

### GOVERNOR UNIT - Continued

Wt. Lbs.		2000 11,125
No: Used	-	40044444444444444444444444444444444444
Bescription	Gavernor, complete	Governor weight washer.  Governor weight pin.  Governor weight pin.  Governor weight pin.  Governor weight pair).  Governor weight pair).  Governor weight pair).  Governor driven gear nut.  Governor driven gear lock washer.  Governor driven gear lock washer.  Governor shaft plunger oiler.  Governor shaft plunger oiler.  Governor shaft plunger oiler.  Governor shaft plunger oiler.  Governor weight shaft coder 62214 D)  Governor weight shaft and spider.  Governor shaft with spider and weights (less Ref.  Nos. 12 and 13)  Sleeve with bushing and bearing  Fulcrum lever with link and bracket, (also includes Ref. Nos. 20, 25 thru 31, 75, 76 and 77)  Fulcrum lever plyot pin.  Fulcrum lever plyot pin.  Fulcrum lever plyot pin.  Fulcrum lever plyot pin.  Gome limit cam screw lock washer  Smoke limit cam screw lock washer  Gottrol rod link pin.  Control rod link pin.  Control rod link pin.  Governor spring, unter.  Governor spring, unter.  Spring seat.  Spring seat.  Spring seat.
Baseh Part No.	600PK264	PNR-20CA WA 1134 PN 7950 BG 7918 WT 7926 A 7920 PL 7920 PL 7920 PL 7920 PL 7920 PL 7920 PL 7920 BB 7911 PC 799 SP 7910 A 7924 A SC 1110-1 WA 22-8CA SC 1110-1 WA 22-8CA WA 22-8CA SC 1136 WA 1156 WA 1156 WA 1156 SP 7931/10 PN 7935 NN 79
I H E Part No.	62192 D	62220 D 62219 D 62219 D 62221 DX 62225 DX 62225 DX 62227 D 62227 D 62227 D 62227 DX 62225 DX 62225 DX 62225 DX 62225 DX 62225 D 62225 DX 62225 DX 6
Rer. No.	:	10004000111111111000000000000000000000

# DETAIL PARTS OF FUEL INJECTION PUMP - Continued GOVERNOR UNIT - Continued

Wt. Lbs.	2.000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0
No. Used	
Description	Governor weight shaft bearing lock washer (spring end)  Governor weight shaft bearing mut (spring end)  Governor end cover  Governor end cover bolt (drilled)  Governor end cover bolt (drilled)  Governor end cover bolt lock washer  Governor end cover bolt washer  Governor end cover bolt washer  Exgon jean mut, 1,4" N. F.  Stop plate screw washer  Exgon jean mut, 1,4" N. F.  Stop plate bridge lock washer  Brather, complete.  Governor inspection cover bolt, drilled  Governor inspection cover bolt washer  Governor inspection cover  Governor inspection  Governor inspection cover  Governor inspection cover  Governor inspection  Governor inspectio
Bosch Part No.	WA 1182 NT 1070 CV 7984A PN 751 SC 1110 WA 1143 WA 114
I H C Part No.	62626 D 62201 D 62201 D 62201 D 62206 D 62206 D 62206 D 62206 D 62205
Ref.	86 66 66 66 66 66 66 66 66 66 66 66 66 6

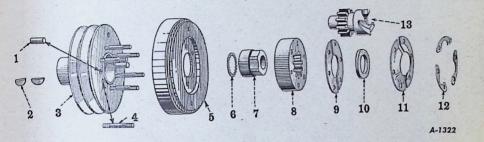
### DETAIL PARTS OF FUEL INJECTION PUMP - Continued

GOVERNOR UNIT - Continued

.233	.004	.093	.031	.004	2000	.010	.020	.000	.020	.008	.001	.052	.046	.014	.031	.093	.012	.012	.007		
ннинг	47		As reald	As req'd	As req'd	As req'd	As req'd	As req'd	As req'd	-0	3 10	1	1	1	o.	Q.	٦	Q	Q	-	1
					•				•												• • •
ings		ing								- 10mor	lock washer.	lower	upper	bolt, upper		. F.				t bore) .	
and bear	pin	With spr (less sp	spring.	020	042)	042	083)	.058).	.083).	ston cover holt	cover loc		-	p cover bo		4 x I" N	ket	bushing	oil seal	lever shaft	
and is an	bracket	plate		spacer (.	spacer (.	spacer (.	`	~	spacer (.			stop	stop	stri	N.F.	screw, 1/	end cover gasket	shaft	shaft	ting	et
plate plate ing le m leve pin.		perating shaft perating shaft	sha	spring	Spring	Spring			ring	ם ל				sing lever	nut, 1/4"		or end c	cing lever	ring lever	for oper	ner gasket
Estter Spring Operat Fulcru	Fulcri	Operating Operating	Operat	Inner	Inner	Inner	Inner	Outer	Outer	Operating		0	0		_			_	Operating 1	Plug	Breather
FN3-386A SC 7930 SH 7950A BK 7913A PN2-20CA	7951	7925A	SP 7949 SR 7914/1	1,667	2/86/	199/3	199/4	1914/3	7914/4	7950-1	122-6CA	CV 7946	7945	7950	16/8CA	350/16CA	1 7978	193	795		90164
		Jan 180		20.5	ט מ	S	S	SE	3 0	2 K	W						G/	<b>岡</b>	PF	PG	GA
54462 D 62256 DX 62243 DA		62250 D	62253 D 62641 D	62637 D	62638 U	J62639 D	[62640 D	62643 D	(62644 D	0.0000	67980 H	62261 D	62254 D	62260 D	0 180T		62203 D	54435 D	54434 D	54441 D	70044 D
257 47 75 75 75	77	78A	78B	80	R S	3 a	20	84	u a	98	87	88	88	90	16	35	93	94	95		

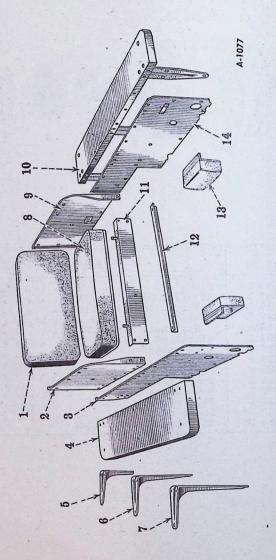
### MEMORANDA

### FRONT POWER TAKE-OFF COUPLING UNIT



Ref.	I H C Part No.	Description.	No. Used	Weight Lbs.
1 2 3 4  5 6 7 8 9 10 11 12 13	47490 D 47487 D 6517 DX 47489 D Q 1905 36794 D 18767 D 6516 D 47488 D 47491 D 47492 D 47493 D 36795 DA 57624 D	Pin	221661111212121	.031 16.000 .062

### SEAT AND FENDERS



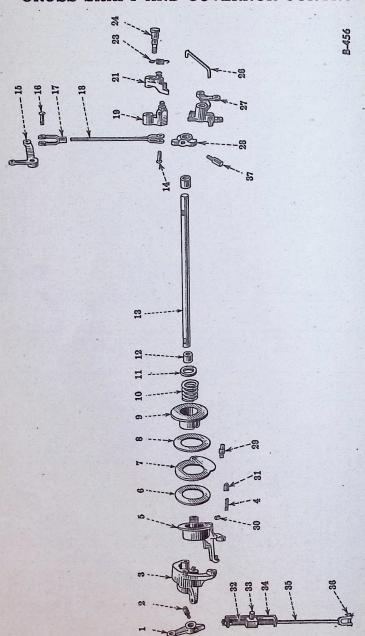
Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

### SEAT AND FENDERS - Continued

Wt. Lbs.	3.500	.148	690.	.013	280.	18.000	.031	.005	200.	.064	.031	.031		000	.045	.031	4.000	.045	.031	2.500	000	.015	.003	.031	.005	.045	.045
No. Used	84	4,	44.	4 0	03 -	4-1-	4 03	4-	4	တဖ	0	נט ה	3	∞ -	1 4	4.	41	Q	03 0	202	0	3 4₁	4-	14	ഹ	ω н <i>ч</i>	#
Description	ont	x 2/T ,	nut, 5/8" nut, 1/2"	Lock washer, 3/8"	100	Seat side sheet, left han	Cap screw, 3/8 x 5/8" N.C.	Lock washer, 3/	Carriage bolt, 3/8 x 5/8"	N.C. 3/8 x 3/4" N.F.	3/8" N.C.	Hex. nut, 3/8" N.F.	32 ]	C	Can screw. 3	3/8" N.	Lock washer, 3/8" Seat support angle, rear	Cap screw, 3/8 x 3/4" N.F.	Hex. nut, 3/8" N.F.	1de	Carriage bolt, 5/16 x 5/8"	Hex. nut, 5/16'	Lock washer, 5/16"	Hex. nut, 3/8" N.F.		Cap screw, 3/8 x 3/4" N.C. Cap screw, 5/8 x 3/4" N.C.	W = /O V O/O CINCIPAL TO
I B C Part No.	42624 D Q 1801	- '	Q 1905 Q 1909	0 1920	0 1846	42636 D 42627 DX	4016	0 1980	42622 DA	0071 0	0 1906			VI 00004	2	0 1905	Q 1920 42630 D	0. 1799	0 1905	Ю		0 1904	-	0 1905	ה דפגם	0 1800	
Ref.	2:	:	::	:	: :	ထတ	:	: :	9:				: :	- [	7	: :	:0	:	:	13:	:	:	:4	:	<u>::</u>		
Wt.	25.000	17.000	.031	.005	12.000	.031		.045	23.000	700	.045	.031	.005		9 A7E	.052	106	690.	.005	3.500	.052	.031	.069	.013	901.		-
No. Used	100	21	40	4	1	4 10	ע	0 -1	4-		ന ധ	o 1	122	(	25 0	34	ω 4	00	40	ω α	34	vê.	44	9	4		
Description	Cushion (back)	Lock washer, 3/8" Seat side sheet, right han	Cap screw, 3/8 x Hex. nut. 3/8" N.	Lock washer, 3/8	Fender Side Sneer,	Hex. nut, 3/8" N.F.	Washer, 13/32 I.D. x 7/8"	16 ga. 3/4"	E	_	Can screw, 3/8 x 3/4" N.F.	3/8" N.C.	Lock washer 3/8"	32	0.D. x 16 ga	Cap screw, 3/8 x 1"	Cap screw,	Hex nut, 5/6"	Lock washer, 3/	Lock washer, 1/2"	Cap screw, 5/8 x l" N.F	Cap screw, 1/2 x 3/4" N.C.	Hex.	Lock washer, 3/8"	Cap screw, 1/2 x l" N.F.		
H H CON NO.	42635 D	0 1920 42628 DX	4016		41536 DX	0 1905	:		Q 1799		0071		0 1905	:	4 0000	56	0 1847			0 1922	2 -1		1909	0 1920			
Ref.		:03		:::	0	****	::		: <	# :		::		: :	,	0	:	:	::		• :		:::	: :			-

# Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

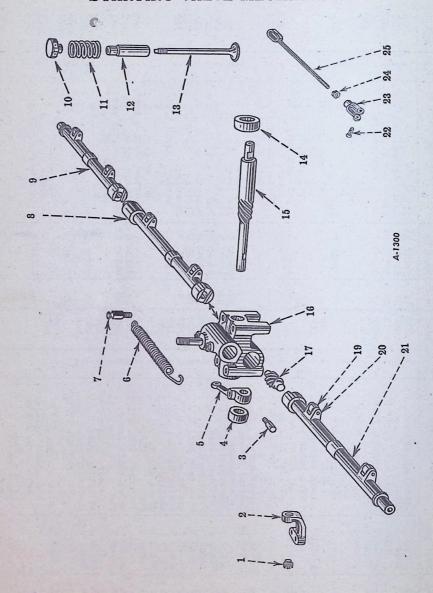
### CROSS SHAFT AND GOVERNOR CONTROL



### CROSS SHAFT AND GOVERNOR CONTROL - Continued

Wt. Lbs.	.312 .008 .180	.125	.656			.013		080	0.00	.031	. 250			.001	.281	o.lis	620.	.050	210	.003		
No. Used	ннн	1	N H		Н	нн		٦-	4-4-	4-1-	22 1-1		1	<b>Н</b> Н	1	co r		-	-	17		
Description	Latch Latch spring.	carburetor control rod	1	Flat point headless set screw, 5/16 x	1-1/4" N.C. Hex. jam nut, 5/16"	N.C	Washer, 21/32 I.D. x 1" 0.D. x No. 12	gage	Plate locating pin.	Poppet.	Spring.	Washer, 13/32 I.D.	gage	Trunnion guide	Governor control rod.	· · · · ·	Cotter, 3/32 x.5/8"	Pin	N.F.	Lock washer, 5/16".		
I H C Part No.	52621 DX 52624 D 55354 DA		8721 D	:				52626 D	45391 D					54124 D		ת שטצפר		20586.D	COST à	6161 0		
Ref. No.	21 23 24	26	27		:	:	:	28	88	323	32			34	35	38	3:	22		:		
Wt. Lbs.	.375	2.875	660.	.068			.023	2.187	.050	.050	1.187	.125	1.812	.0025	.500	100.	.343	700	.500			.023
No. Used	ההה		ω	42		1	нн	1	∞-	102-			2⊢1	НН	НН	14-	4	٠	1-1		Н	П
Description	HH	Bracket	3/8		Oval point headless set screw, 5/16 x	1-1/4" N.C	N.C. Poppet spring.	control lever,	Friction disc.	Friction disc.	Spring	Spring nut	Cross shaft	Pin. Cotter, 3/32 x 1/2".	Cross shaft lever.	Cotter, 3/32 x 5/8".	Operating rod	Hex. jam nut, 7/16"	Latch bracket	Flat point headless set screw, 3/8 x		N.C
I H C Part No.	58125 D 20586 D 0 1903	Ö		0 1920			64545 D		48356 D 64543 D		48358 D	48359 D 50827 D		19306 D	56457 DA	ת אפסמ			8617 DX			
Ref.	H 03 :	10			:	:	41	o	92	- ω σ	10	112	122	14	15		18		19			

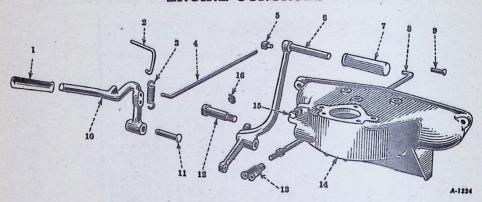
### STARTING VALVE MECHANISM



### STARTING VALVE MECHANISM - Continued

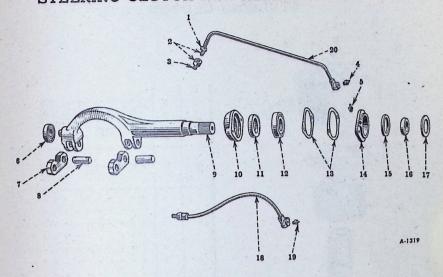
Wt. Lbs.	3.375	.115				.013	. 250	.031	.031	1.937	2 10	ern.			.062	2000		.250	אנט	010.
No. Used	Т	4		CZ	,	25 2	# 1	9	9	cv	c	N .	C	2	-	1		7	-	4
Description	5972 DX Bracket	N.C	Cup point headless	3/4" N.C	Hex. jam nut, 5/16"	Took mother 3/6"	Gear (8 teeth)	Roller	Pin	Shaft, rear.	Alr valve control rod	pin	1	Air walve control rod		Nut. 1/4" type "B".	Air valve		Carburetor control rod	· · · · · · · · · · · · · ·
I H C Part No.	XQ 2722		•			000	324	24916 D	24917 D	77 10	14011 H			ת הצמהו	200		42780 DX		14611 H	
Ref.	16						17.	13	20	22	KK		•	20	2	24	25			
Wt. Lbs.	390.	-004	.781	148	.013	.050	0015	.125	.250	.327	.250	2.250	1.937	.250	.003	200.	278	.093		.843
No. Used	1	-	٦	0	2 02	-		1-1	1	1	7	1	cs .	9	90	00	o (c	- 0		1
Description	Cross shaft thrust screw	Cotter, 3/32 x I-1/4".	bracket	Cap screw, 1/2 x	Lock washer, 1/2".		Took washer 5/16" N.F.		Inner lever.	Cross shaft spring	Spring anchor stud	Shaft, center	Shaft, front	Spring retainer	•		Guide.		Starting valve cross	shaft
I H C Part No.	42759 D	8720 DA		0 1854	0 1922	20586 D	0 1903	42760 D	42754 DA	42755 D	42756 D		32469 DX	42750 D			5024 DAR	T 00/02	56456 D	
Ref.	1	: 03	1	:	:	63	:	4		9	7	80	0	10		11	22	27	15	

### ENGINE CONTROLS



Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.
1	41597 D	Compression release lever handle (rubber) (see 9635 DA - Ref. No. 10)	1.	.156
2	52405.D	Return spring link	1	.125
3	52404 D	Return spring		.114
4	58205 D	Return spring	1	.500
	Q 1905	Hex. nut, 3/8" N.F	i	.031
5	48906 D	Adjusting block	1	.062
		Cotter. 3/32 x 3/4"	1	.002
	8831 DAX	Governor control lever with rubber handle (see 9647 DAX)	1	3.125
6	9647 DAX	Governor control lever, complete (steel)		
		(optional in place of 8831 DAX and	1	
7	41597 D	Governor control lever handle (rubber)	_	
		(see 9647 DX - Ref. No. 6)	1	.156
8	58206 D	Governor control rod	1	1.500
:::	Q 1909	Cotter 1/8 x 3/4".	1	.003
9	15041 H	Pin	1	.125
	(9015 DAX	Cotter, 1/8 x 3/4"	1	.003
	9015 DAZ	handle (see 9635 DA)	1 1	3.187
10	9635 DA	Compression release lever, complete (steel)		
		(optional in place of 9015 DAX and 41597 D)	1	
11	H 4213	Pivot pin	1	.250
12	52403 D	Lever shaft	1	.375
13 14		Adjusting yoke		38.500
	. Q 1848	Cap screw, 1/2 x 1" N.C	1 2 3 5 1	.106
	1 0 2000	Cap screw, 1/2 x 1-3/8" N.C	5	.148
15		Governor control lever stop screw		.250
	. Q 1906	Hex. nut. 3/8" N.C	1 1	.031
16	Q 3615	Governor control lever lubricator (Lincoln No. 5000)	1	.015

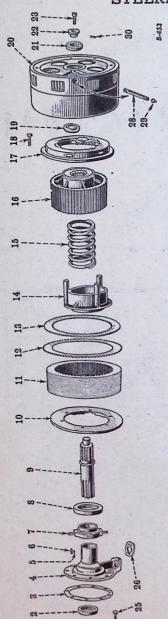
## STEERING CLUTCH AND RELEASE MECHANISM



Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.
1 2 3 4 4 5 6 7 8 9 10 11 12 13 14 15 16 16 17 18 19 20	29899 D 35252 DX 35252 DX 35252 D Q 3615 Q 3615 M 89541 56005 D 56007 D 57099 D 8682 DX 21969 D 56009 D 56009 D 56009 D 56009 D 56009 D 56009 D 56010 D 56017 D 57103 DX Q 1921 Q 1902 Q 1918 Q 3615 57101 DX	Cap screw, 7/16 x 1-1/2 x 1.0 Lock washer, 7/16". Slotted headless pipe plug, 1/8". Felt. Spacer. Felt retainer Release bearing grease tube, assembly Square head machine bolt, 1/4 x 3/4" N.C Hex. nut, 1/4" N. Lock washer, 1/4" Release bearing lubricator (Lincoln No. 5000	244822224412222444422444	.687 .687 .005 .625 .094 .01 .007 .125 .083 .375 .029 .007

Don't order parts from the illustrations only; refer to the list also.

### STEERING CLUTCH



Wt. Lbs.	185.000	7,000 .656 .061 21,000 21,000 228 .127 .013
No. Used	2	88844845 888
Description	Steering clutch	Coupling (12 teeth).  Oil seal Gasket Cage cap, left hand. Cage cap, right hand Cap screw, 5/8 x 1-3/4" N.C. Hex. nut, 5/8" N.F. Lock washer, 5/8". Key pin. Collar key
I H C Part No.	dd 1680#	40890 D 40880 D 40929 D 8742 DX 8743 DX 0 1872 0 1911 0 1925 56006 D 56013 DX
Ref.	-	100 A ro o

(Continued on next page)

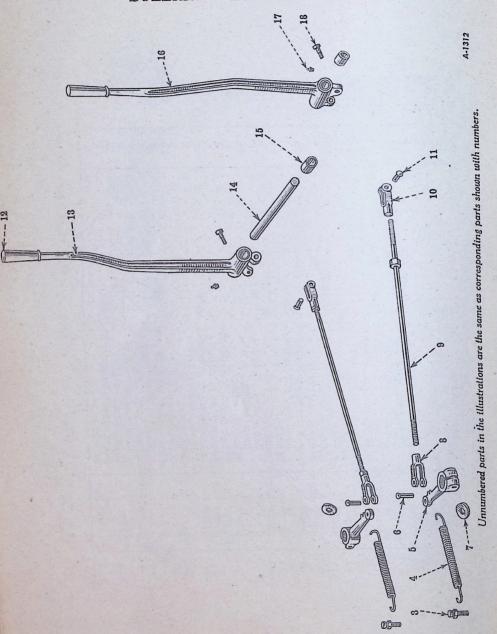
### STEERING CLUTCH - Continued

16.500 16.500 16.500 18.2000 18.2000 19.2000 11.750 11.
<b>~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~</b>
Release collar
56018 D 55253 DA 40877 DB 5715 D Q 1922 (See Note) 40882 D 40882 DB 5712 DB 5712 DB 5712 DB 5712 DB 5714 DD 9717 D 5711 DB 5714 DD Q 1922 5744 DD Q 1925 57589 DA 5714 DD 5714 DD 5714 DD 5712 DB 5712 DB 5
- : 8001       : 111111111111111111111111111111111111

This assembly is made up of a group of friction discs (Ref. 12) and driving discs (Ref. 13).

NOTE:

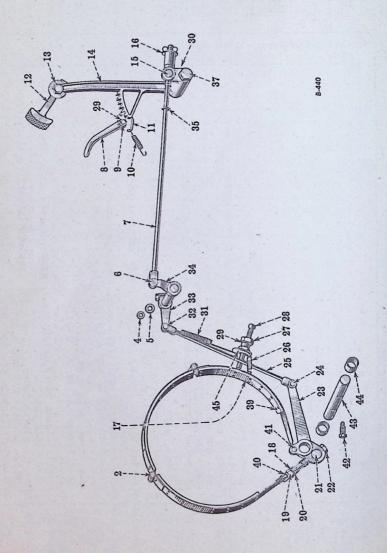
### STEERING CLUTCH CONTROLS



### STEERING CLUTCH CONTROLS - Continued

Wt. Lbs.	1.500 1.500 1.500 1.0501 1.0501 1.0501 1.003 1.0	.046
No. Used		2 03
. Description	Spring anchor.  Boring anchor.  Return spring.  Release lever.  Cap screw, 3/8 x 2-1 Hex. nut, 3/8" N.F.  Lock washer, 3/4".  Cotter, 1/8 x 3/4".  Release lever retaining the screw, 1/2 x 1-1 Lock washer, 1/2".  Steering clutch operating rod.  Hex. jam nut, 1/2" N.  Rescring clutch operating clutch operating clutch lever.  Steering clutch lever.  Cap screw, 5/16 x 2"  Cap screw, 5/16 x 2"  Lock washer, 5/16".  Bushing.  Cap screw, 5/16 x 2"  Lock washer, 5/16".  Bushing.  Cap screw, 5/16 x 2"  Lock washer, 5/16".  Bushing.  Cap screw, 5/16 x 2"  Lock washer, 5/16".  Bushing.  Cap screw, 5/16 x 2"  Lock washer, 5/16".  Bushing.  Cap screw, 5/16 x 2"  Lock washer, 5/16".  Bushing.  Cap screw, 5/16 x 2"  Lock washer, 5/16".  Bushing.  Cap screw, 5/16 x 2"  Lock washer, 5/16".  Bushing.  Cap screw, 5/16 x 2"  Lock washer, 5/16 x 2"  Cap screw, 5/16 x 2"  Lock washer, 5/16 x 2"  Lock washer, 5/16 x 2"  Lock washer, 5/16 x 2"	Hex. jam nut, 1/2" N.F
I H C Parts No.	41768 D 41982 57288 D 8679 DA 6 1905 6 1905 6 1920 15041 H 45794 D 63220 DX 63229 D 15041 H 41597 D 6682 DAX 9641 DAX 9642 DAX 9642 DAX 9642 DAX	
Ref.	80 101 11 12 1 15 1 15 1 15 1 15 1 15 1 1	:

### STEERING BRAKES AND CONTROLS

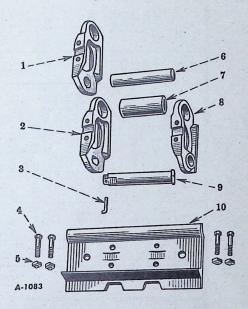


### STEERING BRAKES AND CONTROLS - Continued

Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.	Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.
	60260 DA	Brake band assembly. (includes linings, rivets and joint pins)	2	16.532	23	5801 DX 15041 H	Lever	જ જ જ	4.250
02 .		, 1/8 x	44	.250	25 25	41514 D 56475 D 56478 D	Rod, inner	જ જ	.001
400	20841 D 41519 D 15041 H	Key for lever, inner. Seal Rod pin	જ જ જ	.031	27	Q 1912	hook	જા જા દ	.031
٦.	41512 DA	Cotter, 1/8 x 3/4". Rod, outer	જ જ	1.750	2000	2621	Lock washer, 1"	v cv	
<b>@</b> 0	5818 D 41523 D 0 1922	Pawl Pawl stud	<b>Q Q Q</b>	.187	3 12		Release spring	ભ ભ	.031
10.	41935 D		ા જ જ	.003	33: 55	5813 DA	Cotter, 1/8 x 3/4". Lever, inner	N 01 01	.003
: :	01.17	S/4" N.C	Q	.033	:	0 1922	Cap screw, 1/2 x 1-5/8" N.C.	03 00	.148
H	41521 D	N.C. Pawl link, left hand . Pawl link, right hand.	∞ H H	062	34	(41517 D		Н	2.000
123:	5815 D 41524 D	_	Q Q Q	2.250	35		hand	нαс	2.000
	Q 1913 Q 1927 [ 5816 DB	Hex. nut, 3/4" N.F. Lock washer, 3/4" Pedal, left hand	∞ ∞ ⊢	.045	39	21407 H 61175 V	Lining rivet (.186 x 7/16"	80 %	.0004
4 1 2 9 1 6	41508 D 5812 D 5812 D	Pedal, right hand	НОО	7.000	944	41498 D 41500 DA	t spacer	9788	041
	000000	d lining	CQ (		42	41491 D Q 1922	Shaft stud Lock washer, 1/2" .	N N N	.013
866	41496 D Q 1911 41497 D	Washer 5/8" N.F.	N N N	127	443 443	41492 D 41493 D	Pivot shaft. Bushing.	1 07 41	2.125
222		Pin. Bolt	20202	1.000	9::		Hex. jam nut, l"N.C. Anchor spring hook	03 03 <del>4</del>	.262

### MEMORANDA

### TRACK LINK PIN AND SHOE ASSEMBLY



Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

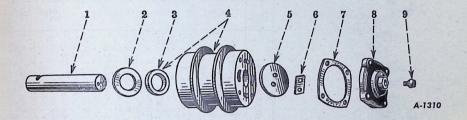
Reef.	I H C Part No.	Description	No. Used	Wt. Lbs.
	05100 0	Track	2 2	1005.000
12345 6789	40977 DB 40978 DB 40980 DB 40986 DB 58075 DA Q 1925 40982 DA 40981 D' 40976 DB 40979 D	Link, right hand.  Master link.  Lock wire Cap screw Nut Lock washer, 5/8" Pin Bushing Link, left hand Master link pin	74	9.000 9.250 .062 .250 4.250 .013 5.125 3.812 9.093 5.312
10	46045 DA		74	32.500

When ordering, always use I H C Part Nos.

### TRACK ROLLER ASSEMBLY

2		
18	Wt. Lbs.	65.000 .127 .013 .501 .500 .500 .7.000 .129
	No. Used	4444 000 200 000 100 100 100 100 100 100 100 100 1
	Description	Roller (double flange)  Nut, 5/8" N.F Lock washer, 5/8".  Bolt Oil seal Carrier bushing (set) Carrier (set) Carrier (set) Ludes Ref.Nos S. 3, 4, 5, 10, 11, 12 and 13). Thrust washer (set) Shaft Shaft Lubricator (Lincoln No. 5750) Lubricator (Alemit. No. 1511)
14 15	. I H C Part No.	
	Ref.	6A 6A 110 113 115 115 115 115 115 115 115 115 115
	Wt. Lbs.	5.500 .043 .043 .062 .125
2	No.	9 9 10 80 80 80 80 80 80 80 80 80 80 80 80 80
11 12 15	Description	Lt. h.
	D H H CO	13: 13: 13: 140 140 140 140 140 140 140 140 140 140
0.00	Ref.	

### TRACK IDLER ASSEMBLY

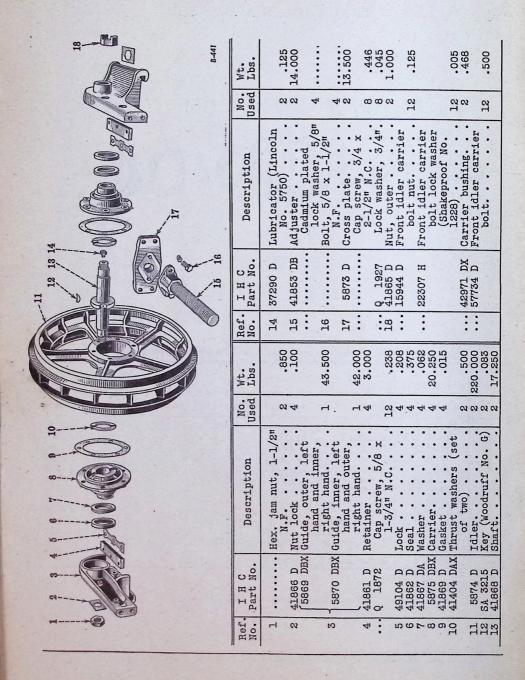


Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

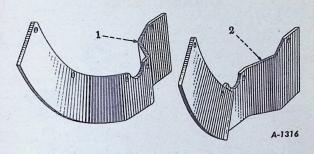
Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.
	67156 D	Track idler assembly (as illustrated) .		33.500
1	40987 D	Shaft	4	13.062
	40993 D	Washer	4	.031
2 3	60250 D	Seal	4	.250
	5725 DBX	Idler and seal	. 4	40.000
4 5	40988 D	Washer	4	1.500
	Q 1849	Cap screw, 1/2 x 1-1/4" N.F	8	.120
6	40991 DA	Lock	4	.015
7 8	42101 D	Gasket	4	.005
8	5726 D	Cap	4	4.000
		Cap screw, 1/2 x 1-5/8" N.C.	16	.148
	Q 1922	Lock washer, 1/2"	16	.013
	[37290 D	Lubricator (Lincoln No. 5750)	4	705
9	or	Thiston (Alamita No. 1511)	4	.125
	[17829 A	Lubricator (Alemite No. 1511)	1 4	1

When ordering, always use I H C Part Nos.

### FRONT IDLER ASSEMBLY

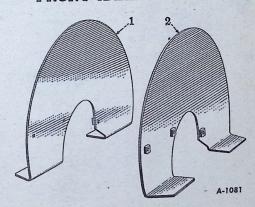


### SPROCKET ROCK DEFLECTOR



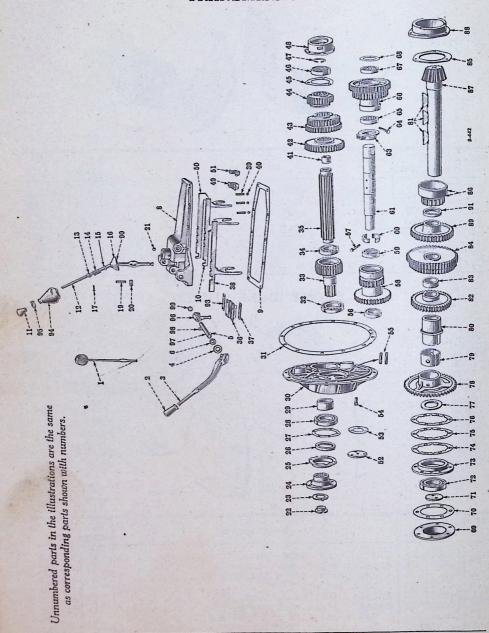
Rdef.	I H C Part No.	Description	No. Used	Wt. Lbs.
1  2	0 7000	Deflector, left hand	5 5 5	14.000 .162 .069 .013 15.156 .162 .069 .013

### FRONT IDLER SHIELD



PRef.	I H C Part No.	Description	No. Used	Wt. Lbs.
1  2 	Q 1922 {42875 DX 42875 DX		1 6 6 1 1	26.000 26.000 .178 .013 26.000 26.000 .178 .013

### TRANSMISSION



### TRANSMISSION - Continued

Wt. Lbs.	2.500	.031	.500	.031	.156	.250	1.750	.0052		2.560	1.500 53.500	.134 .069 .013
No.	1	ннн			<b>чα</b> ,		н	4411		٦,	ннн	요4었니
Description	Shifter lever (rubber)(see 6 Shifter lever (cast iron)	< · ·	Stop, lower Shield (includes Ref. Nos. 17 and 90)	Rivet, 3/16 x 1-1/4". Shaft, small (includes Ref. No. 21)	Shaft, large (includes Ref. No. 21)	Nuck. Lock. Flange. Retainer with oil seal	. ~	N.C. Lock washer, 3/8" Oil seal. Gasket.	Bearing, front (New Departure No. 1214-YL)	(optional) Bearing, front (IHC)	Spacer. Cover with studs.	1-1/2" N.C. Hex. nut, 1/2" N.C. Lock washer, 1/2" Gasket.
I H C Part No.	42512 DAX 67350 DX			40466 DX	40465 DX 13115 D	41665 D 41657 D 5841 DX		Q 1920 52348 D 41666 D	(23276 Н	ST 223	41690 D 64620 D Q 1852	0 1910 0 1922 41668 DA
Ref.	12	13	15	13	ಜ ನ	25 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5		26.	(	82	29 30	21
Wt. Lbs.	.125	2.500	3.031	.148	020.	090	.048	.134	.037		.187	
No. Used	т п	н	Н	44		н α	4	404	-i -	-1	1	н
Description	Oil level rod Hi-Lo shifter lever handle (rubber) (see 9638 DX, Ref. 3)	ш ш	complete (steel) (optional in place of 5938 DAX and 41597 D).	Cap screw, 1/2 x 1-5/8" N.C	Washer.  Key (Woodruff No. 9).  Seal.	Nos. 21 and 99)	Cap screw, 3/8 x 7/8" N.C.	Cap screw, 1/2 x 1-1/2" N.C Lock washer, 3/8" Lock washer, 1/2"	Gasket. Second and third shift	Shifter lever ball	42512 DAX) (see 67350 DX - Ref. 12). Shifter lever ball	(cast iron) (use with lever 67350 DX)
I H C Part No.	DA	5938 DAX 9638 DX		0 1922	64609 D 7220 T 17053 D				42511 D 64615 D	53717 DA	9637 D	
D <sub>4</sub>	44	тэ о		. 0,	7 7 6		• •	0, 0,0,	40	50		_

# SPARE PARTS CATALOG TRANSMISSION - Continued

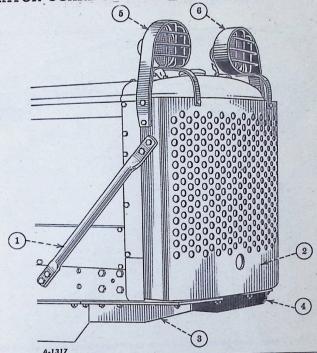
Wt. Lbs.	980	.577	.052	000	.003	.125	CZT.	.013	200 -	7.030	.125			300.	19,000	100	. 125 950	218.19		.093		.016	700.	רסק	200	25.000	1.500	2000
No. Used	-1-		10	) -			20	3 03	•	-1	1			1	1		<b>—</b> с	N -		1		Ч,	7	-	1	1	-	•
Description	Lock (includes Ref. Nos. 37 and 95)	Lock	Cap screw, 3/8 x	Cap screw, 1/2 x	1-1/4" N.F	Pin	Stud.	Lock washer, 1/2"	Bearing (New Departure	No. IZLU YL)	ing retainer bolt	Castle hex. nut, 3/8"	N.F	300	and 36 teeth)	Bearing (New Departure		Bearing retainer, rear.	Oil scoop	Bolt	Castle hex. nut,	•		Bearing (Hyatt No.	Borrongo idlon goon	(31 and 38 teeth)		( ( ) - ( ) - ( )
I H C Part No.		41670 D		0 1849	41660 D		64621 D	0 1922 0 1922	10690 V	את נהאמו				56468 D		18511 D		56465 D						41681 D	ת ואפוו		41681 D	
Ref.	51	52	:	:	5.3	54	22		26	7.7	5	:		58		59	00	09	63	64	•		:	65	20	3	67	
Wt. Lbs.		2.781	2.781	15.750	000	19.750	1.000	.045	3.375	0115	.015		015	15.750	20.750	8.000	.500	080	.005		1.870	1.870	.080	3.125	CTO.	.045	1	0.500
No. Used		٦	7	Н	-		ч.	41	-	62	63		101	-1-	1-1	٦	٦	K	2 10	,	1	П	Н	-1-	1	Q	,	1
Description	Bearing, rear (New De-	(optional)	Bearing, rear (inc)	Shaft and gear (29 teeth)	Bearing (New Departure	Spline shaft with bushing	Guide, front.	Cap screw, 3/8x3/4" N.C.	rail.		Gear Shirter rail	-	poppet ball (optional)	Bushing	(35 and 37	$\overline{}$	Retainer, rear,	Cap screw, 3/8 x	TOOK masher 3/8"	Bearing (New Departure	No. 1212 YL) (optional)	Bearing (IHC) (optional)	Ring	Bearing cage, rear	Guide, rear	3/4" N.C.	Low and reverse shift	rall
I H C Part No.			ST 228	41645 D	64619 D	41654 DX		0 1800			4596 D	13722 D		41671 D			52899 D	•	0601 0	(14234 H		ST 227 .	40888 D	8389 DA	42518 D	O TROO	64613 D	
Ref.		32		22	34	10	36		28	39		40		41	42	44	45	:		:	46		47	48	49	:	20	1

### TRANSMISSION - Continued

Wt. Lbs.	.750	.001			200.		187	020						.750	120	.013		1.000	.125		910.						
No. Used	Т	10			٦		-1-	17		-	1		۲,	7	_	11		1	1	,	-			-	1	•	1
Description	Reverse gear spacer High and low range idler shaft retainer holt	lock washer, 5/8" (Shakeproof No. 1120).	High and low range idler	lock washer, 1/2"	(Shakeproof No. 1124)		Gear shifter hoot	Gear shifter boot clamp	Cadmium plated round	No. 8 - 52 x 3/4"	Cadmium plated square	stove bolt nut,		H1-Lo gear shifter arm .	1-1/4" N.F.	Lock washer, 1/2".	Hi-Lo gear shifter arm	Hi-Lo gear shifter arm	key	Hi-Lo gear shifter arm	Gear shifter housing.	assembly (Includes Ref.	Nos. 2 thru 8, 10 thru 21. 36 thru 40, 49 thru	51, 90 and 93 thru 99).	Bevel pinion and shaft	(includes Ref. Nos. 81	through 86 and 89)
I H C Part No.	52893 D 21491 H		18868 D		62781 D		64603 D					*	2 00000	0 1849	24	9 1922	64607 D	64608 D		25007 V	52414 DA				64616 D		
Ref. No.	91		:		93		94	95	:		:		0	200			26	98		66							
Wt. Lbs.	3.750	012	.457	.013	•	1.375	.069	6.500	.036	7.000	.046	4.750	.312	750	3	1.000	090	con.		5.250					4.750	0.50	070.
No. Used	пн 4	441	-10	2 03		٦,	-i-	1	1	<b>-</b>	1	۲۱	ייכו	٦-		1.	10 10	2		-1				Н		,	7
Description	Washer Retainer, front Cap screw. \( \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \frac\	Lock washer, 1/2"	Washer.	Lock washer, 1/2"	Bevel pinion shaft bearing, front (New	Departure No. 5513).	Bearing cage, front Shim, heavy	Shim, medium	Shim, light	Gear (47 teeth)	Bushing	Sleeve	Key (30 +22+b)	Spacer (39 teetil)	Gear (43 and 49 teeth).	Retainer, rear	Cap screw, 3/8 x 14" N.C.	Bearing (roller assem-	bly and outer race)	(Hyatt No. BU-5215-Z).	gear and pinion. (In-		illustrated under Sec-	tion 6, page 1)	Bearing cage, rear Gear (40 teeth)	Swivel housing shield	onsurug
I H C Part No.	41658 D 5842 DA Q 1858	9	41677 D	0 1922	55844 D		41678 DA		41680 DA	5837 DBX	41672 DA		41661 D		41645 DA	41663 D	U 1804	52009 D		G 81818					5839 DA 41647 DB	20887 DA	
Ref.	69	70.	17		72	1	740	75	76	78	79	88	78 68	832	84	82	:	86		87	;				888	06	

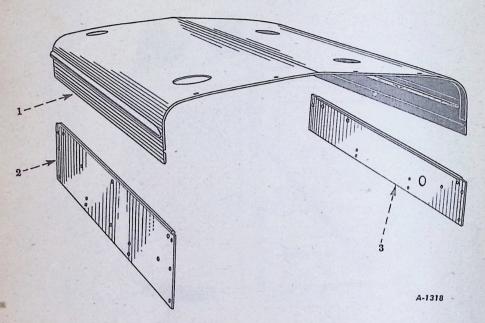
### MEMORANDA

# RADIATOR GUARD AND HEAD LAMP BRUSH GUARDS



1 42898 DBX Brace	17.000 .259 .303
Cap   Cap	.013 102.000 .106 .013 25.625 .384 .539 .313 .045

### HOOD AND SIDE SHEETS



Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

Ref.	I H C Part No.	Description	No. Used	Wt. Lbs.
1	59107 DX Q 1802  Q 1906	Hood sheet	1 8 2 2 4 12	50.000 .052 
2 3	Q 1920 58378 D Q 1800 Q 1920 42594 D Q 1800 Q 1920	Washer, 3/8" I.D. x 7/8" O.D. x 16 ga. Side sheet, left hand. Cap screw, 3/8" x 3/4" N.C. Lock washer, 3/8". Side sheet, right hand Cap screw, 3/8 x 3/4" N.C. Lock washer, 3/8".	8 1 6 6 1 6 6	20.750 .045 .005 21.250 .045 .005

When ordering, always use I H C Part Nos.

### TOOLS

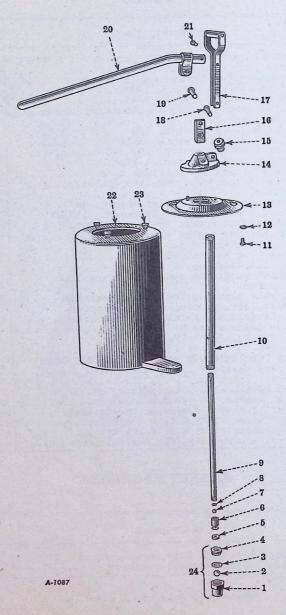
I H C Part No.	Description	No. Used	Wt. Lbs.
9534 D 11858 DA 19289 D 19291 D 19292 D 19323 D	Open end wrench, 2-11/16" (optional with 2584 T) Water pump wrench	1 1 1 1 1	7.000 .125 .250 .312 .250
19324 D 19325 D 19326 D 19327 D 19328 D	and tee).  Hexagon socket wrench, 7/8".  Hexagon socket wrench, 13/16".  Hexagon socket wrench, 1".  Hexagon socket wrench, 1-1/8".  Socket wrench set carrying case.	1 1 1 1 1 1	1.375 .218 .187 .250 .375 .906
19329 D 20156 D 20157 D 25462 DA 25463 D 25466 D 32941 D 42633 DA	Socket wrench set, complete (in carrying case)  Square drain plug socket wrench, 1/2".  Square drain plug socket wrench, 11/16".  Stem handled socket wrench, 1-1/32".  Stem handled socket wrench handle.  Spark plug wrench handle.  Spark plug wrench, 31/32".  Tool box assembly.	1 1 1 1 1 1 1 1	4.093 .125 .171 1.750 2.750 .500 .250 10.562
45578 DA 50092 D 60012 D	Breaker point and spark plug gage bolt wrench	1	.005
1326 E H 156 O 3794	(Lincoln No. A-1218-1H) (see detail list on pages 4 and 5)	1 1 1	24.250 .562 .250
2583 T 2587 T 2588 T 58920 DAX Q 1870 Q 1858 2584 T	(see detail list on page 7)	1 1 1 2 2 1	2.250 1.812 .562 .312 1.250 .216 .281

### GASKET PACKAGES

I H C	Description	No.	Wt.
Part No.		Used	Lbs.
68085 D 52726 DA	Chassis gasket package, complete Engine gasket package, complete	1	3.750 3.687

When ordering, always use I H C Part Nos.

### LINCOLN BUCKET LUBRICATOR

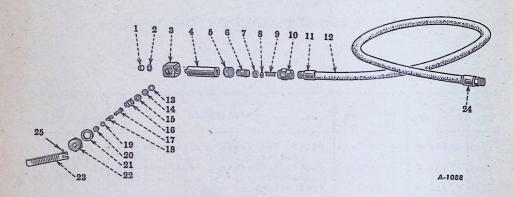


Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

#### LINCOLN BUCKET LUBRICATOR - Continued

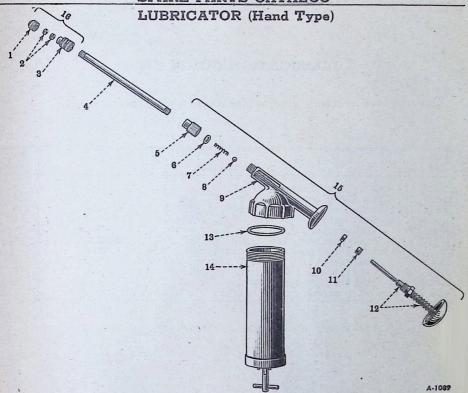
Ref.	I H C Part No.	Lincoln Engr. Co. Part No.	Description	No. Used	Wt. Lbs.
		A-1218-1H D-1217-1H 81368	Bucket lubricator, with hose and coupler	1	19.500 22.250 9.000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	61733 D 62574 D 62573 D 61732 D 40630 D 40652 D 406719 D 40698 D 61738 D 61737 D 	11128 66144 45-608 11127 A-35-020 A-11-550 A-66-002 A-45-559 A-62111 A-61229 50037 66170 A-45-620 B-40-227 A-5750 A-11-557 A-64-280 A-10-472 90-271 11283 A-60041 A-11-225 A-81207	Foot valve body.  Foot valve check ball.  Foot valve disc.  Foot valve collar.  Packing.  Piston .  Ball.  Piston disc.  Pump plunger rod  Pump tube.  Cap screw, 1/4" N.C. x 7/16"  Cover plate washer  Cover.  Pump casting  Button head fitting.  Pump outlet.  Handle.  Toggle pin  Toggle pin  Lever handle  Toggle pin  Container.  Cover screw.  Foot valve	11111111111100111111100111101	.187 .015 .006 .062 .003 .062 .006 .750 .750 .750 .1.500 1.500 1.500 .125 .281 .875 .020 .020 .020 .020 .020 .020 .020 .02

# HOSE ASSEMBLY COUPLER FOR BUCKET LUBRICATOR



Ref.	I H C Part No.	Lincoln Engr. Co. Part No.	Description	No. Used	Wt. Lbs.
:::	36947 D 40728 DA 53192 D	A-80-353 A-81-219-1H A-81-220	Swivel	1	.250 .625 3.000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	40649 D 40657 D 40648 D 53187 D 40642 D 40641 D 40703 D 40713 D 40713 D 40725 D 36946 D 40636 D 40636 D 40636 D 40712 D 40644 D 40711 D 40640 D 40656 D 40710 D 40650 D	A-10-618 A-31-016 A-10-617 A-11-137 A-10-534 A-10-533 A-36-019 A-48-080 A-56-014 A-10-541 A-80-356 A-79-060 A-45-033 A-34-037 A-10-450 A-55-067 A-10-557 A-55-063 A-48-077 A-34-039 A-30-012 A-10-528 A-11-138 A-80-356 A-10-551	Nozzle body plug. Gasket. Giant nozzle body Coupler adapter Swivel collar Swivel stud Cup leather Swivel washer Spring. Swivel body Hose fitting. Hose (5 ft.) Washer. Giant packing Check seat. Spring. Plunger Plunger Plunger Plunger Plunger Packing Gasket Packing gland Handle Hose fitting. Pin	444444444444444444444	.010 .000 .312 .375 .031 .093 .001 .000 .001 .125 .156 1.062 .003 .005 .001 .001 .000 .001 .000 .001

#### SPARE PARTS CATALOG



Unnumbered parts in the illustrations are the same as corresponding parts shown with numbers.

Ref. No.         I H C Part No.         Lincoln Engr. Co. Part No.         Description         No. Wt. Used Lbs.            Q 3794         No. 1020         Lubricator, complete (9 cz. capacity)           2.25           1         39653 D A-10-733         Nozzle cap           1 .015           2         39656 DX A-34-050         Washer (set of 2)           1 .010           3 39652 D A-10-539         Nozzle body           1 .020           4         A-67-020         Standard pipe, 6"           1 .031           5 39875 DX A-10-453         Adapter with gasket           1 .031           6 39655 D A-33-018         Gasket           1 .000           7 39870 D A-55-046         Check spring           1 .000           8 39659 D A-66-011         Check ball           1 .000           9 39868 D A-41-052         Pump body           1 .531           10 39665 D A-34-034         Packing           1 .000           11 39651 D A-10-492         Packing screw           1 .006           12 39663 D B-975         Plunger assembly           1 .218           13 39654 D B-81-903         Tube assembly           1 .250           14 39661 D B-81-903         Tube assembly           1 .750           16 39800 D						
1     39653 D     A-10-733     Nozzle cap			Engr. Co.	Description		
2       39656 DX       A-34-050       Washer (set of 2).       1       .010         3       39652 D       A-10-539       Nozzle body.       1       .020         4		0 3794	No. 1020		_	2.25
	2 3 4 5 6 7 8 9 10 11 12 13 14 15	39656 DX 39652 D 39875 DX 39655 D 39870 D 39659 D 39668 D 39661 D 39654 D 39662 D	A-34-050 A-10-539 A-67-020 A-10-453 A-33-018 A-55-046 A-66-011 A-41-052 A-34-034 A-10-492 89-975 A-32-029 B-81-903 89-974	Nozzle body. Standard pipe, 6". Adapter with gasket. Gasket Check spring Check ball Pump body. Packing. Packing screw. Plunger assembly Gasket Tube assembly. Head assembly.	111111111111111111111111111111111111111	.010 .020 .031 .000 .002 .531 .000 .006 .218 .001 1.250 .750

#### LUBRICATION GUIDE KIT

(For Tractors used by the Corps of Engineers only)

I H C Part No.	Description	No. Used
	Hex. nut, 1/4 " N.F. Lock washer, 1/4".  Plain washer, 9/32" I.D. x 5/8" 0.D. x 16 gage  *Lubrication guide kit (consists of the following parts:)	6 6 6

<sup>\*</sup> Furnished by the Corps of Engineers.

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